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Manual
Cube67+ BN-P

- Installation
- Startup
- Diagnostics
- Technical Data
- DPV1 Support
- Modules

Publisher's Note

Instruction manual for Cube67+ BN-P (Article Number: 56521)

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Murrelektronik GmbH
Falkenstrasse 3
D-71570 Oppenweiler

Phone +49 (0) 7191 47-0
Fax +49 (0) 7191 47-130
info@murrelektronik.de

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www.murrelektronik.com

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Bus Manual:
General explanations and functions for each bus.

On this subject, please click on the links to the next page.

IO-Link:
General explanations and functions for IO-Link.

On this subject, please click on the links to the next page.

System Manuals:
Describe the system in general and give an overview about the products, accessories and documentation.

Art. No.	Designation
56030	Cube 20 System
56970	Cube 67 System
56974	Cube 67+ System

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Bus Node Manuals:
Describe product-specific features and settings to the Bus Node and to the modules which are connected to it.

Art. No.	Designation
56521	Cube67+ BN-Profibus
56980	Cube67 BN-Profibus
56981	Cube67 BN-DeviceNet
56982	Cube67 BN-CANopen
56983	Cube67 BN-Ethernet / IP
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Art. No.	Designation
56972	Instruction to Safetycategory 3

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Here are links to the bus user manuals:

>>> PROFIBUS (www.PROFIBUS.com)

>>> IO-Link IO link (www.io-link IO link.com)

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Important Information

Symbols and Icons

This manual contains information and instructions you must comply with in order to maintain safety and avoid personal injury or damage to property. They are identified as follows:

Notes indicate important information.

Warnings contain information that, if ignored, may cause damage to equipment or other assets or, if you fail to comply with safety precautions, may constitute a danger to the user's health and life.

These instructions are recommendations issued by Murrelektronik.

Intended Purpose

Before starting the devices, read this manual carefully. Keep it in a location that is accessible to all users at all times.

The products that are described in this manual were developed, manufactured, tested, and documented in compliance with the relevant safety standards. In normal cases, these products do not constitute any danger to persons or objects, provided the handling specifications and safety instructions described in this manual are observed. They meet the specifications of the European EMC Directive (2004/108/EC).

WARNING!

The devices are not safety devices conforming to the relevant standards. The safety functions of the system are no longer guaranteed.

- **Do not use the OFF state of the outputs to implement safety-related requirements of the system/machine.**

The products are designed for industrial use. An industrial environment is defined as one in which loads are not connected directly to the public low-voltage power grid. Additional measures must be taken if the products are used in private, business, or trade environments.

The safe, troublefree functioning of the products requires proper transportation, storage, mounting, and careful operation. Operation of the devices for their intended purposes is only guaranteed when the enclosures are fully mounted. If aggressive media are used, check their material resistance depending on the application.

Current safety and accident prevention laws valid for a specific application must be observed for the configuration, installation, setup, maintenance, and testing of the devices. The power supply must comply with SELV or PELV. Power sources in accordance with EN 61558-2-6 (transformer) or EN 60950-1 (switched-mode power supply) meet these requirements.

Only use cables that meet the requirements and regulations for safety, electromagnetic compatibility, and, if necessary, telecommunications terminal equipment specifications.

Qualified Personnel

Only qualified, trained electricians knowledgeable in the safety standards of automation systems may configure, install, set up, maintain, and test the devices. The requirements concerning qualified personnel are dependent on the requirements profiles described in ZVEI and VDMA. For this reason, electricians must know the contents of the manual "Weiterbildung in der Automatisierung" (Further Training in Automation Systems) issued by ZVEI and VDMA and published by Maschinenbau-Verlag, Post Box 710864, 60498 Frankfurt, Germany) before installing and maintaining the devices. They are therefore electricians who are capable of assessing the work executed and any possible dangers arising from this due to their professional training, knowledge, experience, and their knowledge of the pertinent standards; or who have a level of knowledge equivalent to professional training due to their many years of activity in a comparable field.

Only Murrelektronik technical personnel are allowed to execute work on the hardware and software of our devices, if they are devices not described in this manual.

WARNING

Unqualified tampering with the hardware or software, or failure to observe the warnings cited in this manual may result in severe personal injury or damage to property.

1 Description of the Cube67+

Cube67 stands for rational and economic solutions. The innovative fieldbus system from Murrelektronik has simplified and modernized decentralized installations from the ground up. Now the Cube67+ has a plus that means even more flexibility.

Cube67+ is a new innovative bus node. With this module, Murrelektronik expands its tried and tested Cube67 system. It allows even greater optimization for fieldbus installations, whatever the application.

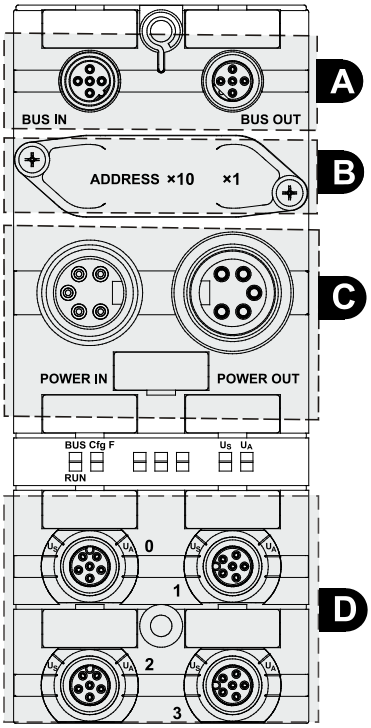
2 Installation

2.1 Mounting

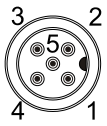
Please refer to the Technical Data Manual for the mounting regulations.

You will find an overview in the section "Manual Overview and Layout" in this manual.

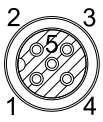
2.2 Overview of Connections Cube67+ BN-P Art. No. 56521



A



BUS IN



BUS OUT

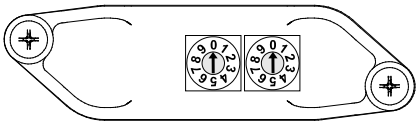
+5V	**Pin 1**	+5V
A grün / green / vert / verde / verde / verde	**Pin 2**	A grün / green / vert / verde / verde / verde
0V	**Pin 3**	0V
B rot / red / rouge/ rojo / vermelho / rosso	**Pin 4**	B rot / red / rouge/ rojo / vermelho / rosso
n.c.	**Pin 5**	n.c.
⏚	Gewinde Thread Filet Rosca Filetto Rosca	⏚

B

Adressierung / Addressing / Adressage / Endereçamento / Indirizzamento / Direccionamiento:

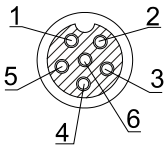
0 ... 99

x 10 x 1



D

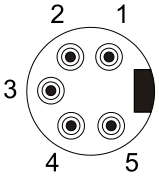
Cube67 System



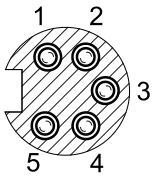
1	+24V U_A / 4A
2	+24V U_S / 4A
3	0V
4	bus internal
5	bus internal
6	0V

C

POWER IN



POWER OUT



Pin 1 0V
Pin 2 0V
Pin 3 ⏚
Pin 4 +24V U_S / 8 A
Pin 5 +24V U_A / 8 A

Fig. 1 Overview of Connections Cube67+ BN-P Art. No. 56521

3 Startup

3.1 Internal System Connection Features

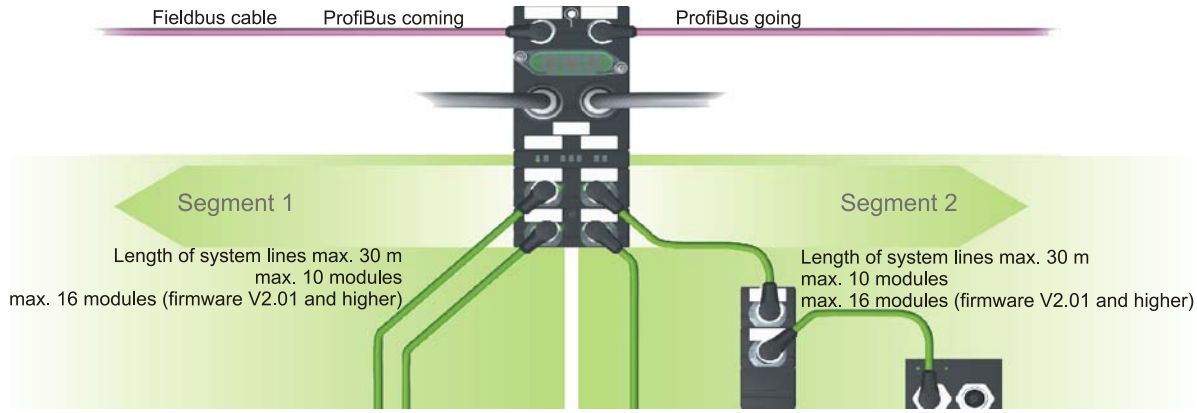

Fieldbus cable
ProfiBus coming
ProfiBus going
Segment 1
Segment 2
Length of system lines max. 30 m
max. 10 modules
max. 16 modules (firmware V2.01 and higher)
Length of system lines max. 30 m
max. 10 modules
max. 16 modules (firmware V2.01 and higher)

Fig. 2 Internal System Connection Features

Fig. 3 Firmware version

Up to firmware 2.0, 20 modules can be connected, 10 per segment. From firmware V2.1, 32 modules can be connected, 16 per segment. The firmware version is printed on the side of the bus module.

The internal system connection is divided in 2 segments and, due to this division, is operable with longer line lengths and a larger number of modules.

If modules are connected to an associated socket x, this is referred to as a connection to line x, whereby x corresponds to the related socket number. For example, Line 0 for Socket 0, Line 1 for Socket 1, etc.

Sockets 0 and 2 belong to the left segment of the internal system connection; sockets 1 and 3 belong to the right segment. Every segment can be operated with the maximum line length of 30 m. The segments are freely distributable depending on application requirements. This means that a single system line with a length of 30 m connected to socket 0 or 2 (or 1 or 3) can be distributed as required to the sockets belonging to the segment, just as well as 6 system lines each with a length of 5 m, or 10 system lines with a length of 3 m. The same applies to the number of modules: max. 16 modules are allowed per segment. They can be connected only to one segment socket, or distributed as required

to the two segment sockets. The layout details to configure the hardware are required in the associated PROFIBUS configuration tool.

3.2 Internal System Connection Terminations

To ensure data transmission, a terminating resistor must be fitted to the start and end of each segment. This means that unused sockets on the internal system connection must be fitted with a terminating resistor, provided at least one module is operated on the segment.

If an expansion module is used as the last module in a line, its output socket "Out" must also be fitted with a terminating resistor. If a compact module is used as the last module in a line, no terminating resistor is required at its segment end.

3.3 Terminating PROFIBUS Segments

A terminating resistor must be fitted to the start and end of each PROFIBUS segment. The terminating resistors must be powered in order to guarantee a physically clean signal level. A maximum of 32 users may be connected to a segment.

3.4 Assigning and Setting the PROFIBUS Address

The PROFIBUS address is set directly on the Cube67+ BN-P by means of two rotary switches. Values are permitted between 0 and 99. Usually, a DP Master assigns the addresses 0 to 2. We therefore recommend setting the address starting with Address 3 on Cube67.

The address setting is read in once after the power supply is connected. A change of address only becomes effective, therefore, when the module power supply is reset. When the address is assigned, make sure you provide each PROFIBUS device with a unique individual address.

3.5 GSD File

The equipment described in this manual requires a GSD file

MURR0B8F.*

The file suffix indicates the language version. GSD files are available in six different languages.

Language	File Suffix
Default = English	***.gsd**
English	***.gse**
German	***.gsg**
Spanish	***.gss**

Language	File Suffix
French	***.gsf**
Italian	***.gsi**
Portuguese	***.gsp**

Tab. 1 GSD file suffixes

The GSD file is downloadable from the Murrelektronik website:

http://www.murrelektronik.com/.

3.6 Baud Rates

All devices in a PROFIBUS network operate at a standard baud rate that is defaulted by the bus master. The Cube67+ bus node recognizes the baud rate setting automatically. Comply with the maximum permissible line lengths dependent on the baud rate used as shown in the table below. The values refer to one segment in each case. Larger network topologies are implementable across several segments by means of repeaters.

Maximum Permissible Line Lengths in a PROFIBUS Segment

Transmis-sion speed [Kbit/s]	9.6	19.2	45.45	93.75	187.5	500	1500	3000	6000	12000
Cable length [m]	1200	1200	1200	1200	1000	400	200	100	100	100

Tab. 2 Cable lengths in a PROFIBUS segment

3.7 Configuration and Parameter

The Cube67+ system is usually configured with the help of a configuration tool provided by the PROFIBUS Master manufacturer. The master sends the configuration telegram to the slave while the system is booted, and defines the number of input and output bytes. Cube67+ uses the special identifier format according to IEC 61158. Cube67+ can only be operated with DP masters that support the special identifier format.

With the help of this information, the Cube67+ bus node checks the installation for compliance with the projected configuration. If the bus node detects a difference between the nominal configuration transferred by the DP Master and the physical configuration, the bus node reports a configuration error message (parameter error message) and does not exchange data with the DP Master. A configuration or parameter error is displayed at the bus node by the LED "CFg F". If an error occurs, the LED "Cfg F" lights up red.

Cube67+ System is calibrated as a modular system. If your configuration tool supports this, the bus node "56521 BN-P" and the virtual module "Line 0" are added automatically when you add Cube67+ and bus node. The bus node "56521 BN-P" is always the first module in the configuration. It is capable of running without any expansion modules. However, all four virtual modules "Line 0" to "Line 3" must always be fitted in the projected configuration.

3.7.1 Maximum lengths of telegrams

Please note:

The maximum length of a PROFIBUS telegram is 244 bytes. This limits the telegrams of the configuration, parameter, input, and output data to this length.

Usually, the configuration tool used will check the telegram length.

You will find the description of the modules including the lengths of their configuration, parameter, input, and output data in chapter

Fehler! Verweisquelle konnte nicht gefunden werden. **Cube67+ Modules**
Fehler! Verweisquelle konnte nicht gefunden werden. **Cube20 Modules**
Fehler! Verweisquelle konnte nicht gefunden werden. **Cube67 Digital E/A-Modules**

3.7.2 Assigning Slots / Real Module

The maximum number of slots in the PROFIBUS configuration is limited to 64 per GSD. A maximum of 32 real modules can be connected to the bus nodes. The remaining slots are required for virtual modules. Virtual modules, such as placeholders, line modules, and I/O link modules, were introduced in order to conduct a more detailed analysis of the PROFIBUS configuration and to simplify the configuration process for you.

Please note that the number of modules to be configured may be restricted when you use Cube67+ modules. For example, it is not possible to use more than eleven modules of type Cube67+ DIO12 IOL4 E 8xM12 Art. No. 56752, as they require five slots each: one slot for the module itself and four slots for virtual modules.

Diagnostic messages are assigned to the associated slots, i.e. if a diagnostic message is received for Slot 3, this message is related to the module at Slot 3. Module numbering may start with Slot 0 or Slot 1, depending on the configuration tool.

3.7.2.1 Line Modules

The bus node has enhanced diagnostic options with the line modules. In analogy to the four lines of the bus node, four line modules are added to the GSD file. The use of line modules supplies the bus node with an exact topology that can then be compared to the actual topology of the connected modules.

All four line modules must be added to the hardware configuration. Line 0 is added automatically when the bus mode is added. The remaining line modules must be added manually.

Modules connected to Socket 0 of the bus node must be added between line modules Line 0 and Line 1 in the hardware configuration. Modules connected to Socket 1 of the BN-P must be connected between Line 1 and Line 2, etc.

Pay attention to the features of the internal system connection!

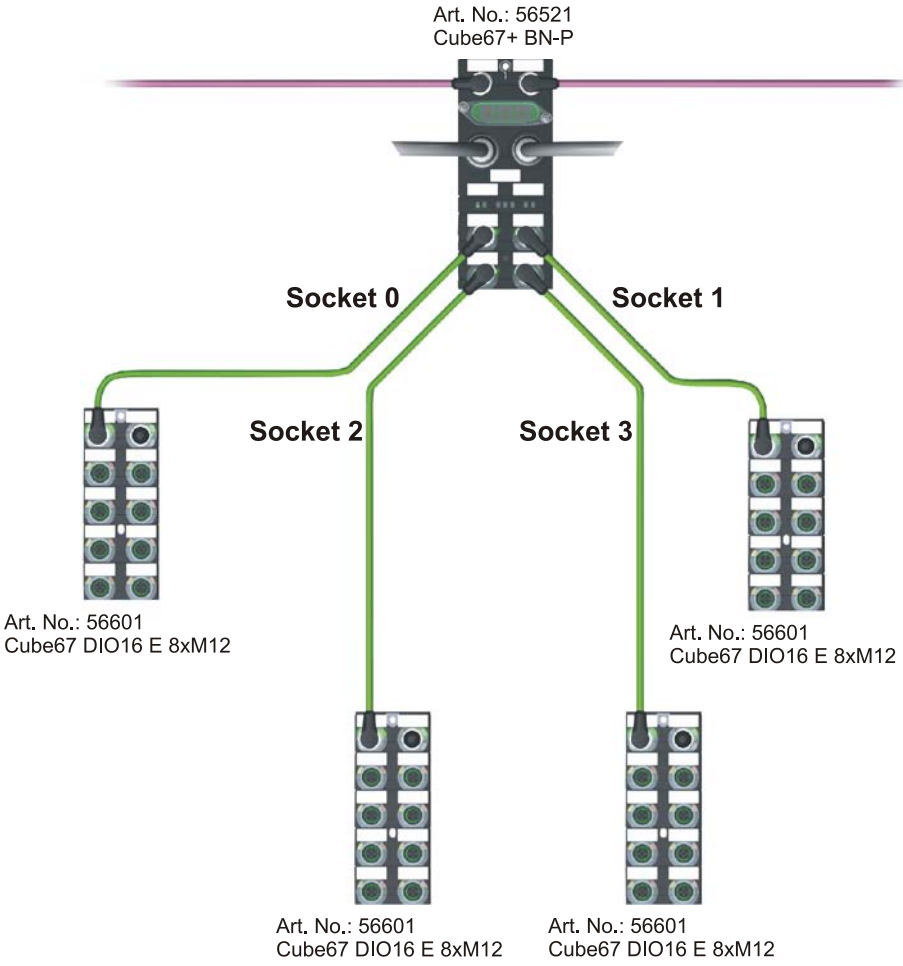


Fig. 4 Example configuration

The example configuration shown in Fig. 5 should be configured in Simatic HW Config - as shown in the figure below:

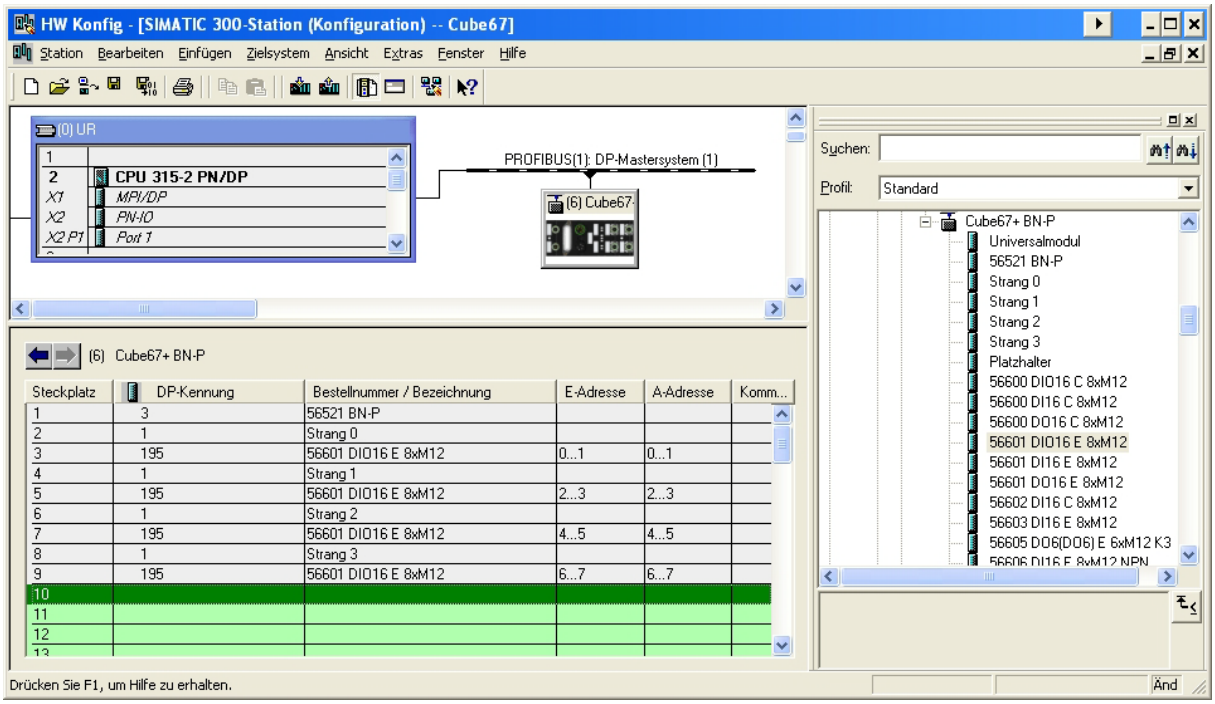

HW Konfig - [SIMATIC 300-Station (Konfiguration) -- Cube67]
Station Bearbeiten Einfügen Zielsystem Ansicht Extras Fenster Hilfe
(0) UR
1
2 CPU 315-2 PN/DP
X1 MPI/DP
X2 PN-IO
X2 P1 Port 1
PROFIBUS(1): DP-Mastersystem (1)
(6) Cube67+
Suchen:
Profil: Standard
Cube67+ BN-P
Universalmodul
56521 BN-P
Strang 0
Strang 1
Strang 2
Strang 3
Platzhalter
56600 DIO16 C 8xM12
56600 DI16 C 8xM12
56600 DO16 C 8xM12
56601 DIO16 E 8xM12
56601 DI16 E 8xM12
56601 DO16 E 8xM12
56602 DI16 C 8xM12
56603 DI16 E 8xM12
56605 DO6(DO6) E 6xM12 K3
(6) Cube67+ BN-P
Steckplatz | DP-Kennung | Bestellnummer / Bezeichnung | E-Adresse | A-Adresse | Komm...
1 | 3 | 56521 BN-P
2 | 1 | Strang 0
3 | 195 | 56601 DIO16 E 8xM12 | 0...1 | 0...1
4 | 1 | Strang 1
5 | 195 | 56601 DIO16 E 8xM12 | 2...3 | 2...3
6 | 1 | Strang 2
7 | 195 | 56601 DIO16 E 8xM12 | 4...5 | 4...5
8 | 1 | Strang 3
9 | 195 | 56601 DIO16 E 8xM12 | 6...7 | 6...7
10
11
12
Drücken Sie F1, um Hilfe zu erhalten.

Fig. 5 Example of a line configuration

The bus node software checks for the presence of the virtual modules Line 0 to Line 3. If one of these modules is not present, the bus node signals a configuration error (LED "Cfg F" red).

3.7.2.2 Differences between Cube67+ Modules

Cube67+ modules may only be operated with a Cube67+ bus node but not with a Cube67 bus node.

3.7.2.3 Placeholders

Placeholders can be added and they provide the simplest possible was to expand the Cube67+ system. A placeholder is a module with a standard data length of zero. Its function is to keep a slot free for the possible future addition of a module. Not supported is the function of reserving I/O addresses for a placeholder.

Due to the new line modules added, it is explicitly recommended not to use placeholders any more. If it is definitely planned not to expand the configuration, the use of placeholders offers you no benefits.

3.7.2.4 Virtual Modules

Virtual modules are used to define additional functionality for a physically real Cube67+ module.

The example below is the module 56752 Cube67+ DIO 12 IOL 4 E 8xM12:

Basic module functionality:	4 freely parameterizable M12 sockets each with 2 channels, usable as input or output. The basic functionality is defined in the GSD file via the module 56752 DIO12 8xM12 IO Link.
Additional module functionality:	4 M12 sockets with I/O link functionality at Pin 4. The additional functionality for the 4 I/O link ports is controlled by adding virtual modules, e.g.: IOL_DEAKTIVIERT (deactivated) IOL_I_SIO_OEFFNER (NC) IOL_I_SIO_SCHLIESSER (NO) IOL_I_1 Byte IOL_I_2 Byte … IOL_I/O_1/1 Byte IOL_I/O_2/2 Byte … IOL_O_1 Byte IOL_O_2 Byte …

This permits the selection of functionality as well as the selection of data size in the process map by drag&drop in the configuration tool. It is then possible to make an exact simulation of the real actual configuration. If one of the sockets is required, it is simply deactivated by adding the module IOL_DEAKTIVIERT. If a larger data quantity is required, select a module with the corresponding size, e.g. IOL_I_16 Byte. If you want to use a particular socket as a standard I/O (SIO), then enter the corresponding module, e.g. IOL_I_SIO_SCHLIESSER.

You can then freely define the I and O address for each I/O link socket in the configuration tool using these modules.

On a Cube67+ module, the correct number of virtual modules must always be added behind the basic module in the configuration tool. Errors result in the signaling of a configuration error (LED "Cfg F" red).

Diagnostic messages for additional functionality are signaled to the virtual module slots.

3.7.3 Example : Configuration of a Cube20 system with Simatic Step7®

The task is to enter the following configuration:

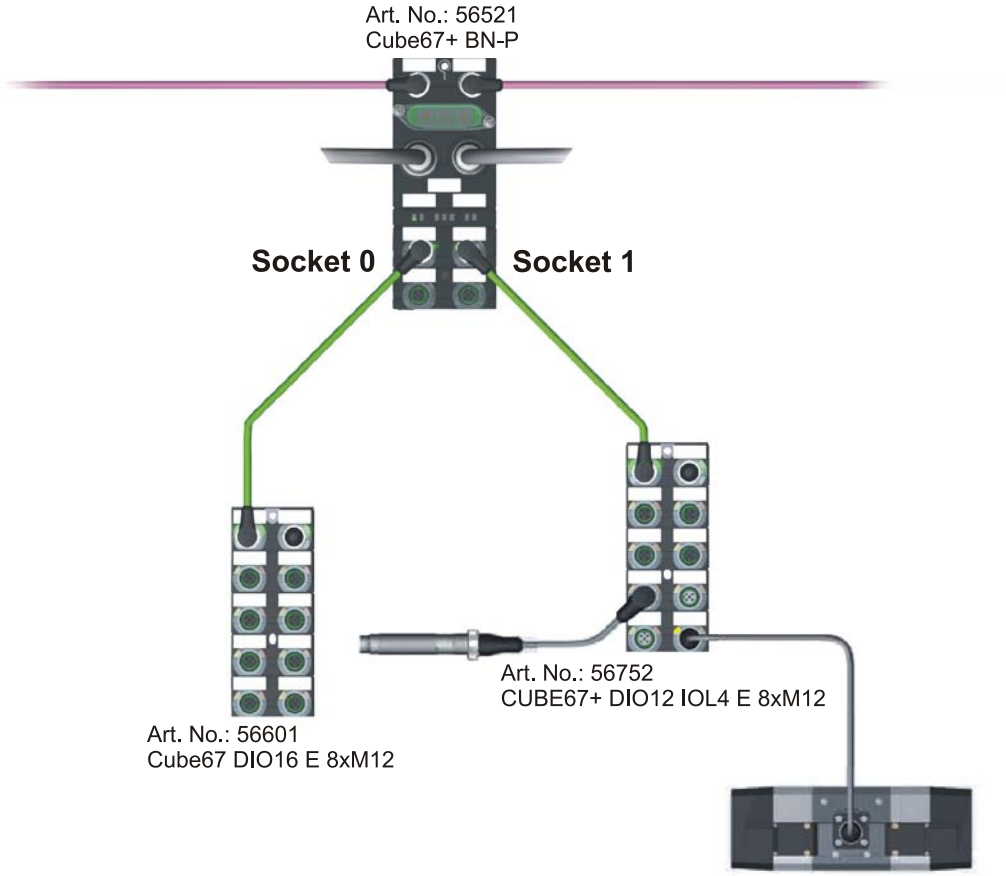


Fig. 6 Configuration of a Cube67+ project

❶

You will find the Cube67+ BN-P Art. No.: 56521 in the Hardware Catalog of the SIMATIC HW Config under "PROFIBUS-DP" → "Other Field Devices" → "I/O" → "Cube67".

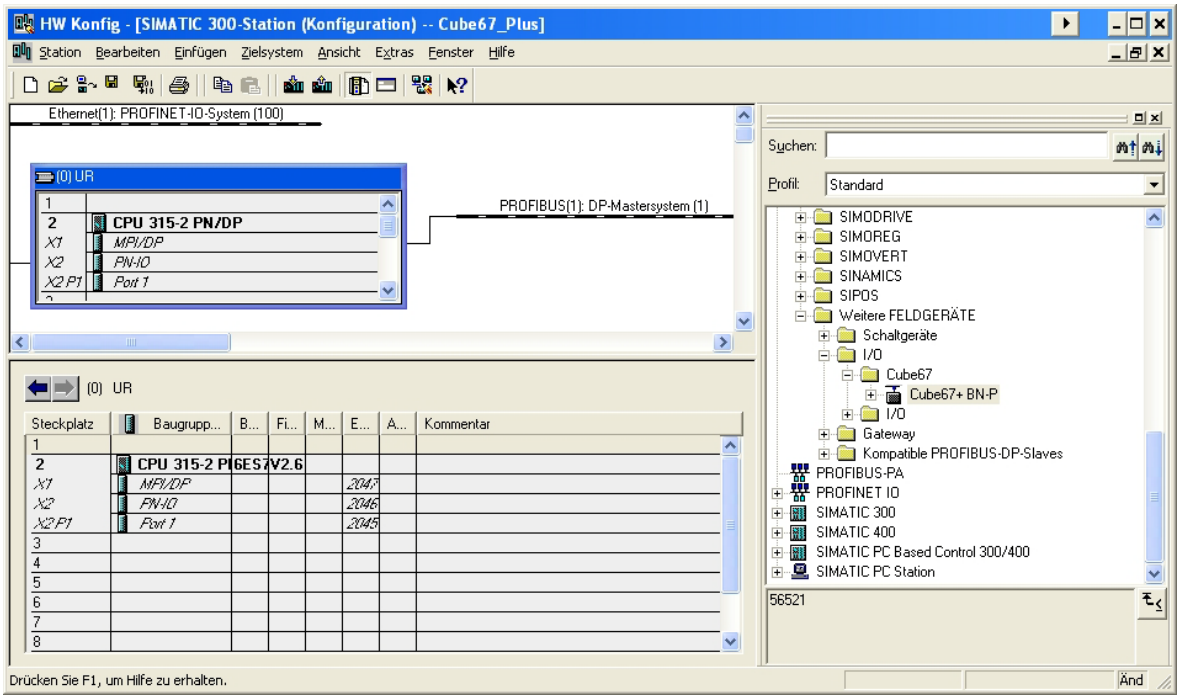


Fig. 7 Cube67+ BN-P Art. No.: 56521 SIMATIC HW Config

❷

Mark the "Cube67+ BN-P" and drag the entry by holding down the left mouse button, or double-click on the PROFIBUS line. The modules "56521 BN-P" and "Line 0" are added automatically. In order to add other modules (max. 62) to the configuration, simply double-click on the corresponding entry in the Hardware Catalog.

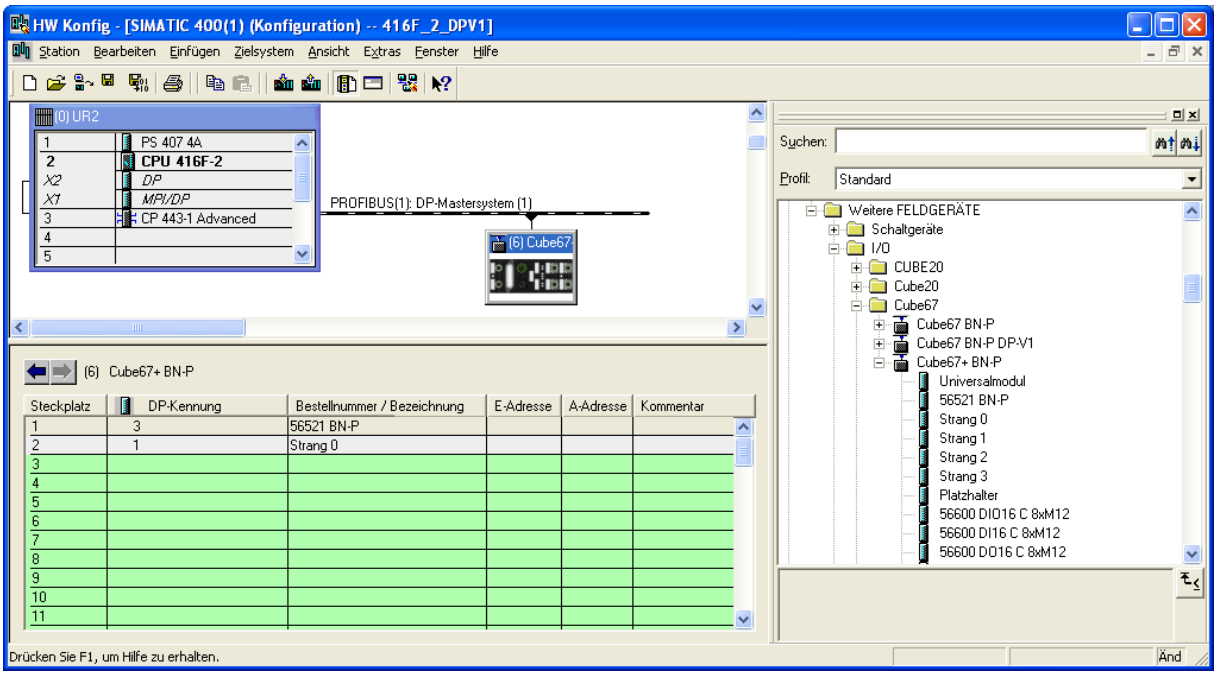


Fig. 8 Cube67+ BN-P added

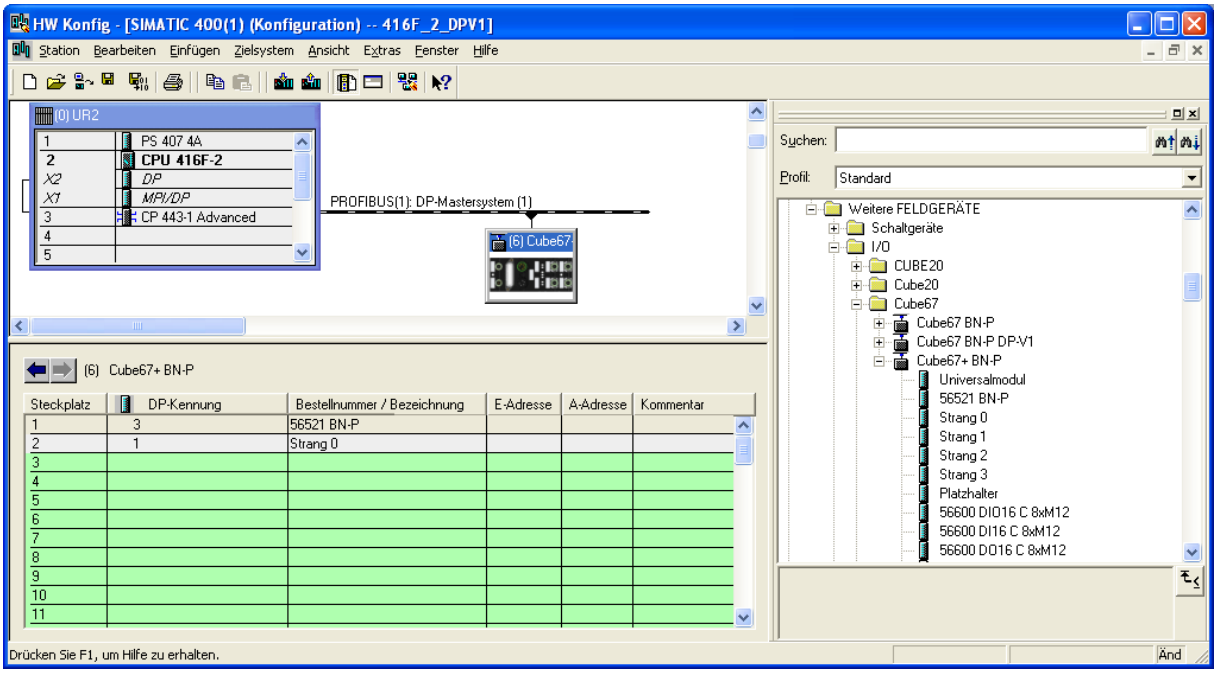


Fig. 9 Adding Cube67 modules to the SIMATIC HW Config

❸

Double-click on any module to open a list box containing the parameter settings for this module. Select the settings you require.

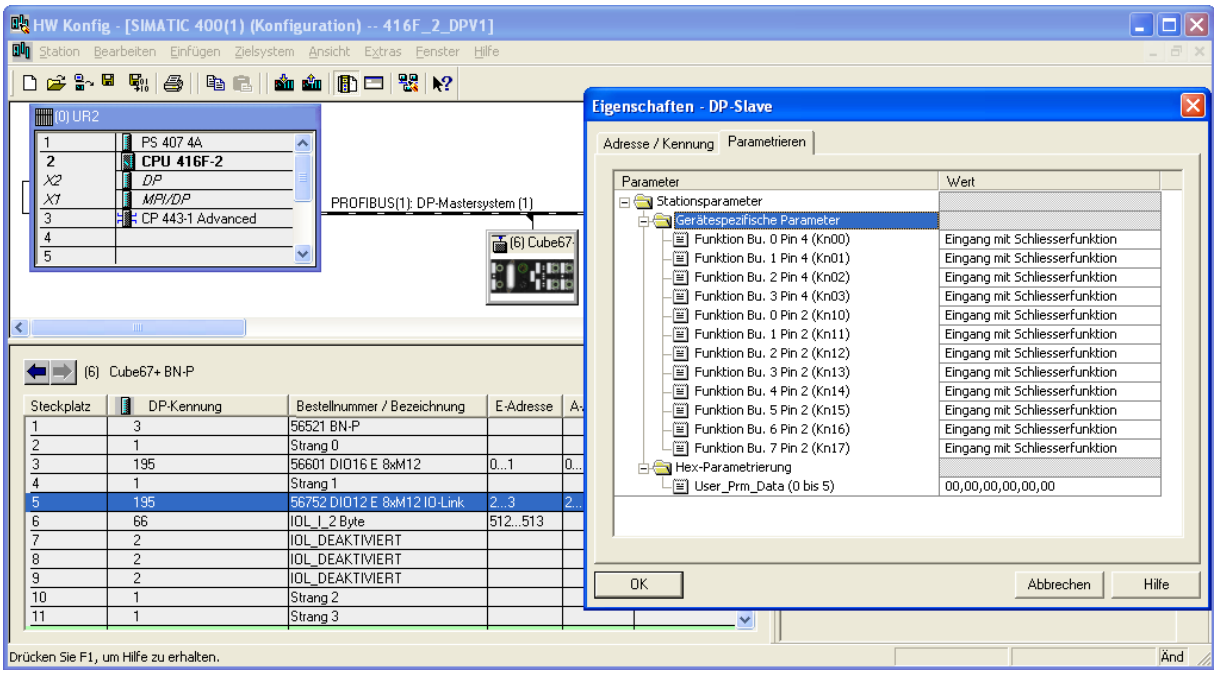

HW Konfig - [SIMATIC 400(1) (Konfiguration) -- 416F_2_DPV1]
Station Bearbeiten Einfügen Zielsystem Ansicht Extras Fenster Hilfe
(0) UR2
1 PS 407 4A
2 CPU 416F-2
X2 DP
X1 MPI/DP
3 CP 443-1 Advanced
4
5
PROFIBUS(1): DP-Mastersystem (1)
(6) Cube67
(6) Cube67+ BN-P
Steckplatz | DP-Kennung | Bestellnummer / Bezeichnung | E-Adresse
1 | 3 | 56521 BN-P
2 | 1 | Strang 0
3 | 195 | 56601 DIO16 E 8xM12 | 0...1
4 | 1 | Strang 1
5 | 195 | 56752 DIO12 E 8xM12 IO-Link | 2...3
6 | 66 | IOL_I_2 Byte | 512...513
7 | 2 | IOL_DEAKTIVIERT
8 | 2 | IOL_DEAKTIVIERT
9 | 2 | IOL_DEAKTIVIERT
10 | 1 | Strang 2
11 | 1 | Strang 3
Eigenschaften - DP-Slave
Adresse / Kennung Parametrieren
Parameter | Wert
Stationsparameter
Gerätespezifische Parameter
Funktion Bu. 0 Pin 4 (Kn00) Eingang mit Schliesserfunktion
Funktion Bu. 1 Pin 4 (Kn01) Eingang mit Schliesserfunktion
Funktion Bu. 2 Pin 4 (Kn02) Eingang mit Schliesserfunktion
Funktion Bu. 3 Pin 4 (Kn03) Eingang mit Schliesserfunktion
Funktion Bu. 0 Pin 2 (Kn10) Eingang mit Schliesserfunktion
Funktion Bu. 1 Pin 2 (Kn11) Eingang mit Schliesserfunktion
Funktion Bu. 2 Pin 2 (Kn12) Eingang mit Schliesserfunktion
Funktion Bu. 3 Pin 2 (Kn13) Eingang mit Schliesserfunktion
Funktion Bu. 4 Pin 2 (Kn14) Eingang mit Schliesserfunktion
Funktion Bu. 5 Pin 2 (Kn15) Eingang mit Schliesserfunktion
Funktion Bu. 6 Pin 2 (Kn16) Eingang mit Schliesserfunktion
Funktion Bu. 7 Pin 2 (Kn17) Eingang mit Schliesserfunktion
Hex-Parametrierung
User_Prm_Data (0 bis 5) 00,00,00,00,00,00
OK
Abbrechen
Hilfe
Drücken Sie F1, um Hilfe zu erhalten.

Fig. 10 Parameterizing Cube67 modules in the SIMATIC HW Config

3.7.4 Cube67+ BN-P Art. No. 56521

3.7.4.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
56521 BN-P	56521	0 byte	0 byte	03_{hex} DC_{hex} $C9_{hex}$ $0A_{hex}$

Tab. 3 Identification of Cube67+ BN-P Art. No. 56521

3.7.4.2 Parameters

Number of parameter bytes: 10

Bit assignment of parameter Byte 0

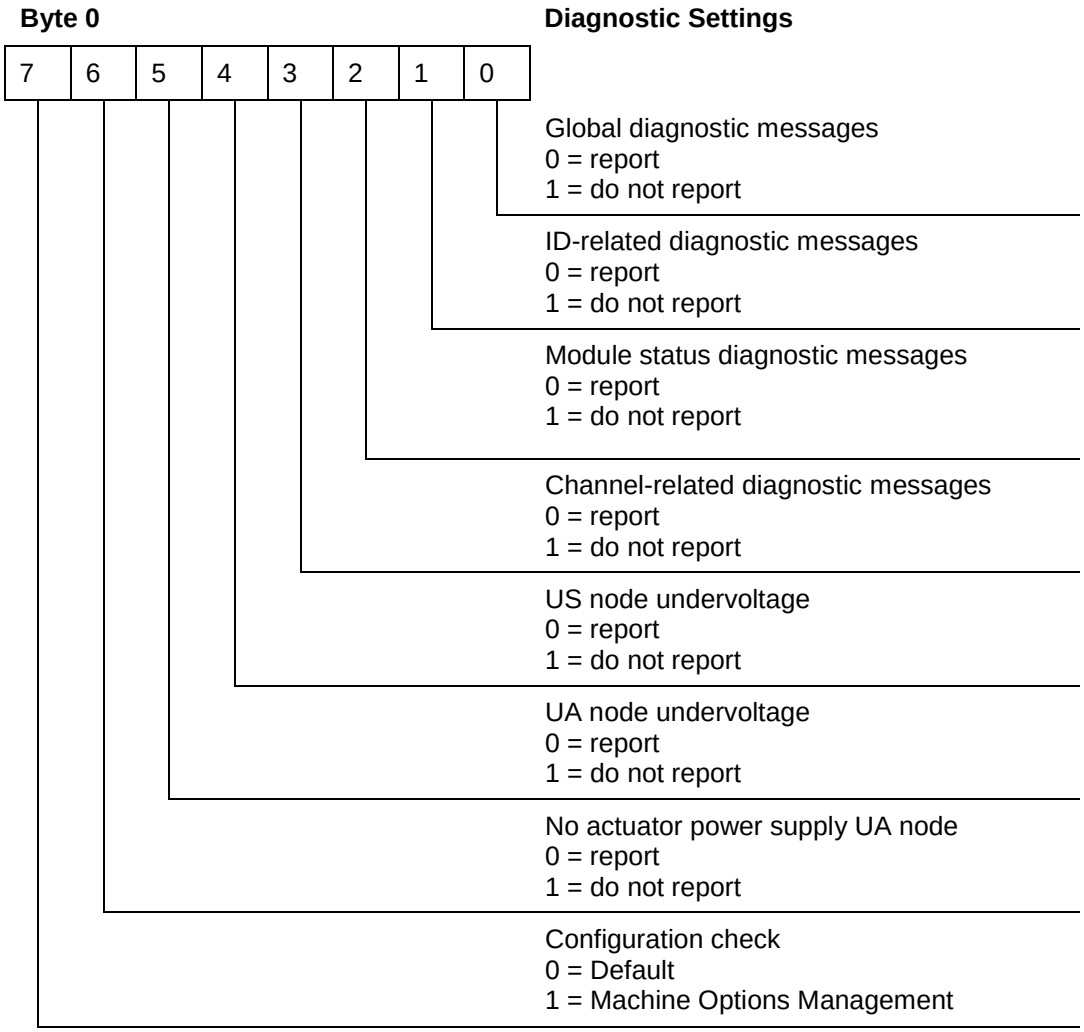


Fig. 11 Parameter byte 0 of Cube67+ BN-P Art. No. 56521

Setting	Explanation
Global diagnostic reports	This defines whether the diagnostics are reported or not. If you select "Do not report", no diagnostics are reported, even those of expansion modules.
ID-related diagnostic messages	This defines whether ID-related diagnostics are reported or not. If you select "Do not report", no diagnostics are reported, even those of ID-related expansion modules.
Device-related diagnostic messages	This defines whether device-related diagnostics are reported or not. If you select "Do not report", no device-related diagnostics are reported, even those of expansion modules.
Channel-related diagnostic messages	This defines whether channel-related diagnostics are reported or not. If you select "Do not report", no channel-related diagnostics are reported, even those of expansion modules.

Setting	Explanation
US node undervoltage	This defines whether a US undervoltage is reported or not.
UA node undervoltage	This defines whether a UA undervoltage is reported or not.
No actuator PS UA nodes	This defines whether no actuator power supply of UA is reported or not.
Configuration test	This defines whether you want to use "Machine Options Management" or retain the default configuration.

Tab. 4 Explanations of diagnostic settings

Bit assignment of parameter Byte 1

Reserved

Bit assignment of parameter Byte 2

This defines whether you want to obtain actuator supply diagnostics such as undervoltage or no voltage messages for the assigned slot.

0 = report
1 = do not report

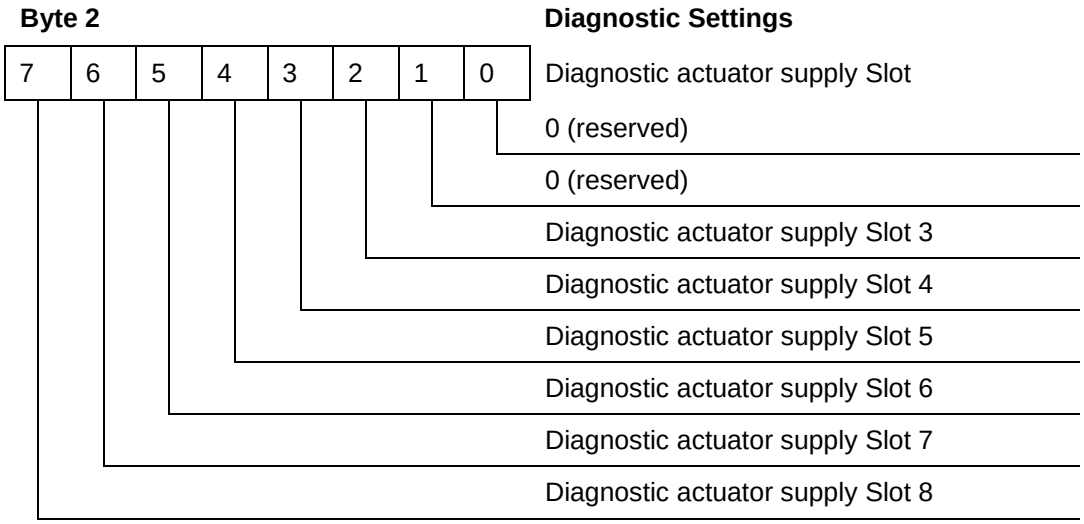


Fig. 12 Parameter byte 2 of Cube67+ BN-P Art. No. 56521

Bit assignment of parameter bytes 3 to 9

This defines whether you want to obtain actuator supply diagnostics such as undervoltage or no voltage messages for the assigned slot.

0 = report
1 = do not report

Byte 3: Diagnostic actuator supply for Slot 9 ... 16

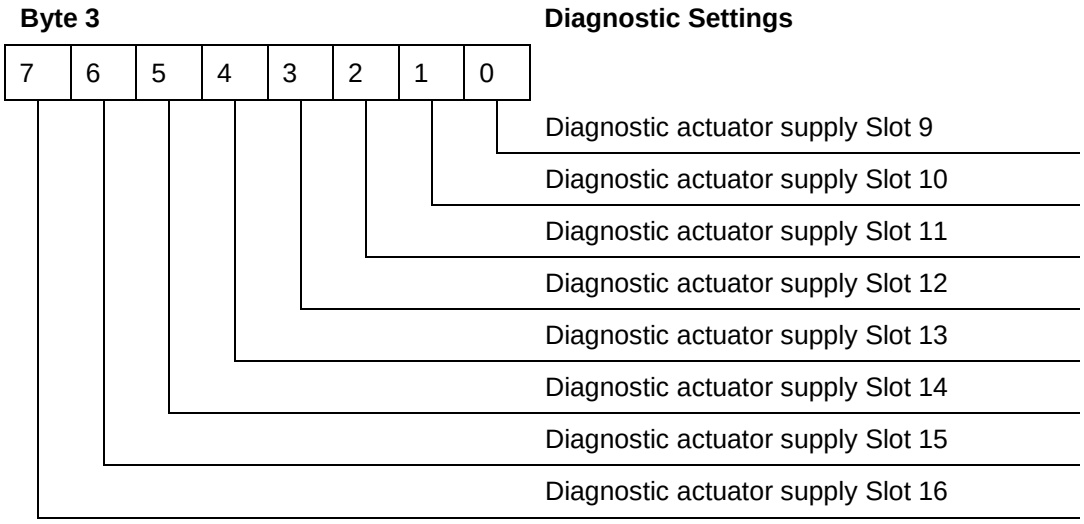


Fig. 13 Parameter byte 3 of Cube67+ BN-P Art. No. 56521

Bit assignment of Byte 4 to 9:

Byte 4: Slot 17 ... 24

Byte 5: Slot 25 ... 32

Byte 6: Slot 33 ... 40

Byte 7: Slot 41 ... 48

Byte 8: Slot 49 ... 56

Byte 9 Slot 57 ... 64

4 Diagnostics

4.1 LED Indicators

The Cube67+ System is capable of detecting and reporting numerous errors. Errors (diagnostics) are reported in two ways:

Diagnostic per LED indicator

Diagnostic using PROFIBUS diagnostic telegram.

4.1.1 Meaning of "Bus Run" LED States

The "Bus Run" LED represents the sate of PROFIBUS communication on the Cube67+ BN-P Art. No. 56521.

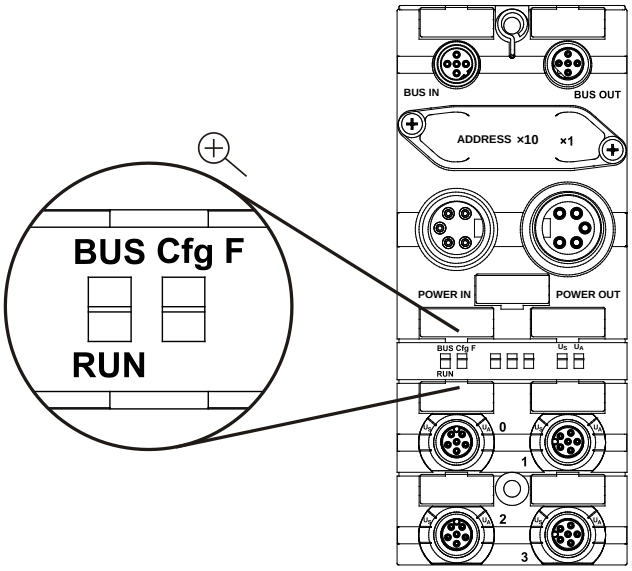


Fig. 14 Bus-Run LED of Cube67+ BN-P Art. No. 56521

LED Display	Response	State
■	Lights up continuously (green)	PROFIBUS-DP data exchange
▨	Flashing (green)	No DP data exchange
□	Off	PROFIBUS firmware not yet initialized

Tab. 5 Bus-Run-LED of Cube67+ BN-P Art. No. 56521

4.1.2 Meaning of "Cfg F" LED States

The "Cfg F" LED represents the state of a correct/incorrect configuration on the Cube67+ BN-P Art. No. 56521.

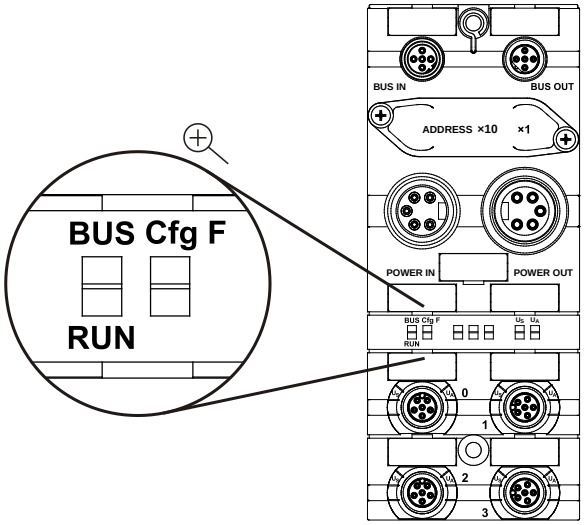


Fig. 15 Cfg F LED on Cube67+ BN-P Art. No. 56521

LED Display	Response	State
■	lights up permanently (red)	Real configuration does not match the projected configuration
■	Off	Configuration correct

Tab. 6 Cfg F LED on Cube67+ BN-P Art. No. 56521

4.1.3 Meaning of US and UA LED states

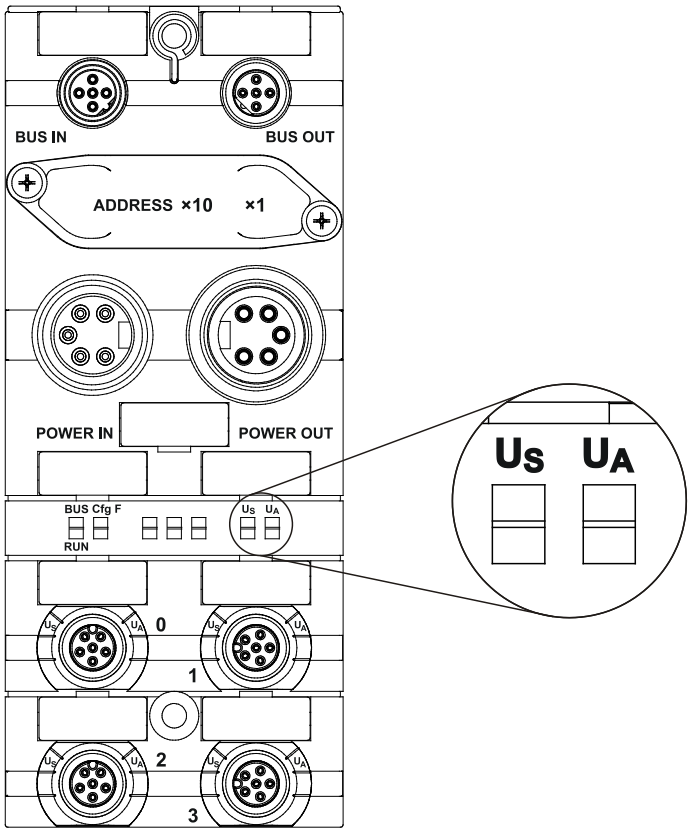


Fig. 16 US / UA LEDs on Cube67+ BN-P Art. No. 56521

Sensor and System Supply

LED indicator US	Response	State
	Lights up permanently (green)	OK (> 18 V)
	Lights up permanently (red)	Undervoltage
	Off	No supply or Sensor supply < 13 V
	red flashing	Internal Error

Tab. 7 Status of sensor and system supply on the bus node

Actuator supply

UA LED display	Response	State
	green permanently on	OK (> 18 V)
	red permanently on	Undervoltage
	Off	No supply or actuator supply < 13 V
	red flashing	Internal Error

Tab. 8 Status of actuator supply on the bus node

4.1.4 Meaning of US / UA LED States at Internal System Connection Sockets

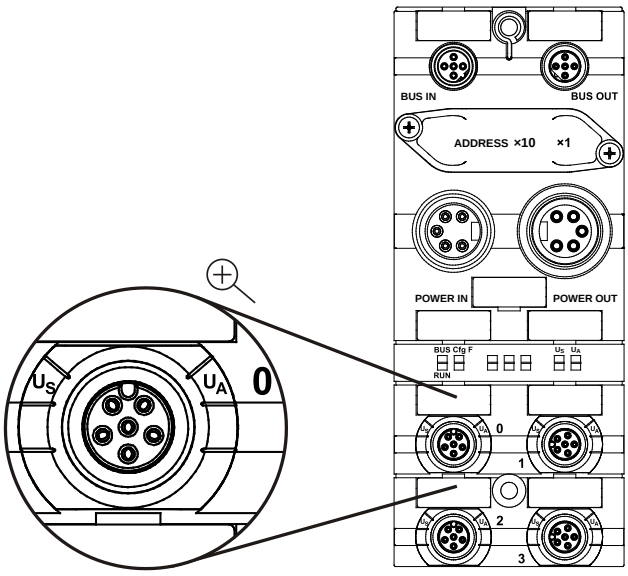
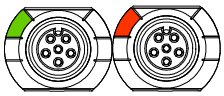
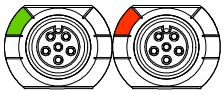
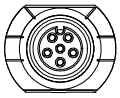


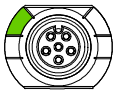
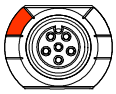
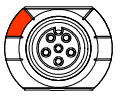
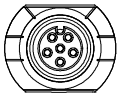
Fig. 17 US / UA LEDs on Cube67+ BN-P Art. No. 56521

System Communication

LED Display US	Response	State
	green / red lights up permanently	Data exchange
	green / red Flashing	No data exchange
	Off	No communication

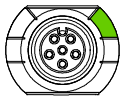
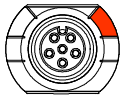
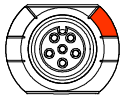
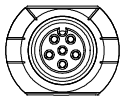
Tab. 9 Status of System Communication on the Bus Node

Sensor and System Supply

LED Display US	Response	State
	green	OK (> 18 V)
	red	Undervoltage or short-circuit sensor supply
	red	Overload I > 4 A
	Off	No supply or sensor supply < 13 V

Tab. 10 Status of sensor and system supply on the bus node

Actuator supply

LED Display UA	Response	State
	green	OK (> 18 V)
	red	Undervoltage or short-circuit actuator supply
	red	Overload I > 4 A
	Off	No supply or actuator supply < 13 V

Tab. 11 Status of actuator supply on the bus node

4.2 Diagnostics via the Fieldbus

There is a total of four levels of diagnostic information over the PROFIBUS on the Cube67+.

Diagnostic Type	Description
Norm Diagnostic	Bytes 0 to 5 always contain the Profibus norm diagnostic. For example, it indicates whether a diagnostic is present at all or not.
Identification-Related Diagnostic	The ID-related diagnostic refers to the module position in the configuration telegram. Events related to the corresponding module are signaled by a set bit. It can be disabled by parameter ("Do not report“) and occupies Bytes 6 to 14 in the parameter telegram.
Device-Related Diagnostic	The device-related diagnostic refers to the module position in the configuration telegram. The system indicates whether a module is defective, or incorrect, or non-existent. It is selectable by parameter ("Do not report“) and occupies 20 bytes in the parameter telegram. It follows the ID-related diagnostic, provided it is present.
Channel-Related Diagnostic	The channel-related diagnostic supplies precise information about channel errors in modules (e.g. short-circuit) and represents the ID-related diagnostic. It can be disabled by parameter ("Do not report“). The channel-related diagnostic always has a fixed length of 3 bytes and follows the ID-related diagnostic and the device-related diagnostic, provided it is present. Up to 64 channel-related diagnostics can be output.

Tab. 12 Diagnostics via the Fieldbus

PROFIBUS DP-V1 offers the option of using alarms and stats messages for diagnostics. This is not supported by Cube67+ BN-P. If the PROFIBUS Master configuration tool offers a choice, then select Mode DP-V0 for the DP alarm mode (diagnostic mode).

All diagnostic messages are reported slot-dependent. Note here that some configuration tools name the first slot as Slot 0; others name it Slot 1. The reported diagnostic messages refer to the numbering of the first slot with "Slot 1".

4.2.1 Standard Diagnostic Information Format

Standard diagnostic information Byte 0 to 5

Byte 0

7	6	5	4	3	2	1	0

Diag.station_non_existent

This bit is set by the DP master if this DP slave is not accessible (to generate a group diagnostic). The DP slave sets this bit to zero.

Diag.station_not_ready

This bit is set by the DP slave, if the SP slave is not ready for data exchange.

Diag.cfg_Fault

This bit is set by the DP slave when the configuration data previously received from the master does not match the configuration data detected by the DP slave..

Diag.ext_diag

This bit indicates that a diagnostic entry is present in the slave-specific diagnostic area (Ext_Diag_Data).

Diag.not supported

This bit is set by the DP slave as soon as a function not supported by the DP slave is requested.

Diag. Invalid slave response

This bit is set by the DP master when an implausible response is received from an addressed DP slave. The DP slave sets this bit to zero.

Diag.prm_fault

This bit is set by the DP slave if there was an error in the previous parameter telegram, e.g. incorrect length, incorrect ID number, invalid parameters.

Diag.master_lock

The DP slave was parameterized by another master. This bit is set by the master, if the address in Byte 3 is not equal to Ffhex and is not equal to the slave's own address. The DP slave sets this bit to zero.

Fig. 18 Standard diagnostic information Byte 0

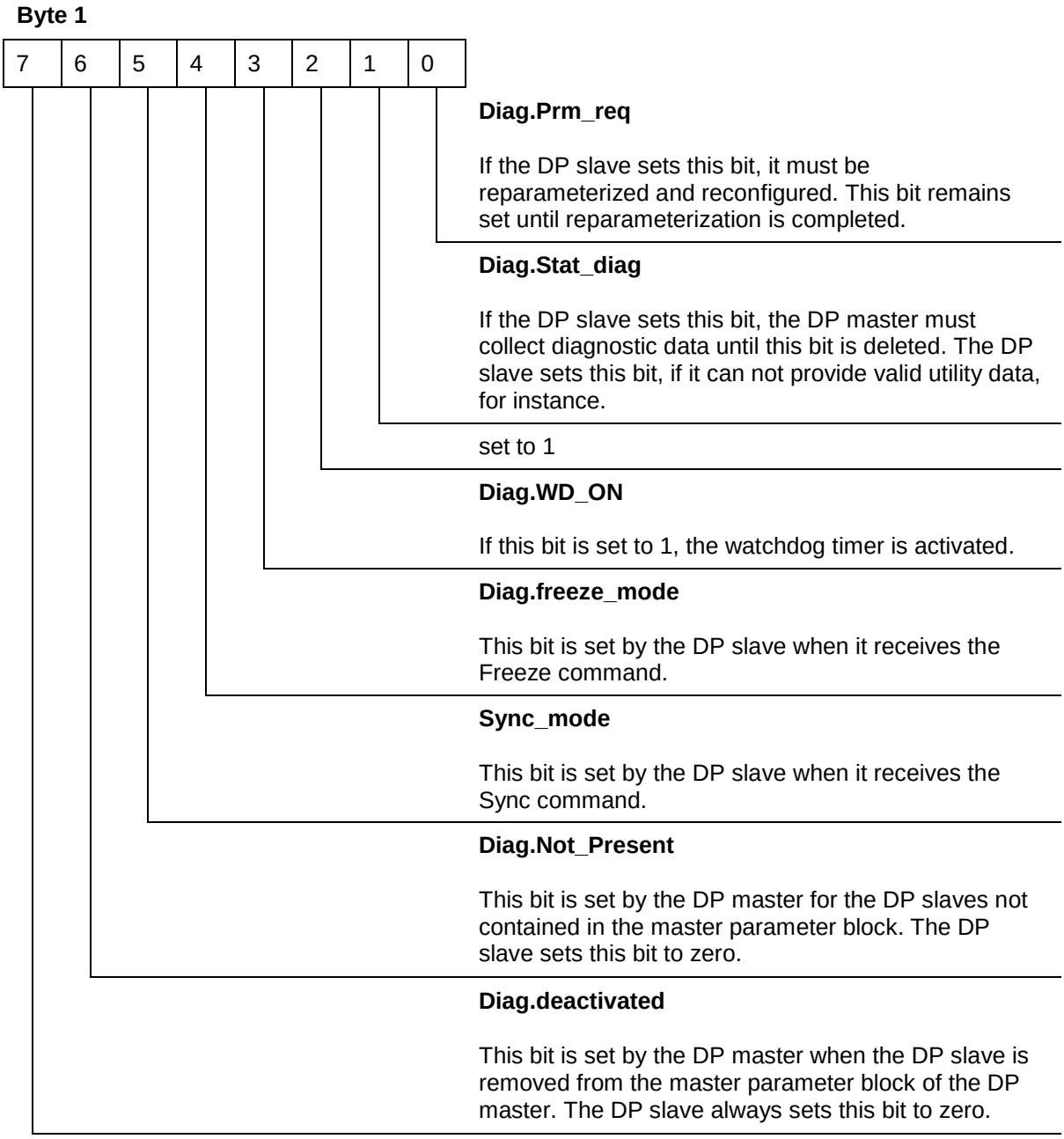

Byte 1
7
6
5
4
3
2
1
0
Diag.Prm_req
If the DP slave sets this bit, it must be reparameterized and reconfigured. This bit remains set until reparameterization is completed.
Diag.Stat_diag
If the DP slave sets this bit, the DP master must collect diagnostic data until this bit is deleted. The DP slave sets this bit, if it can not provide valid utility data, for instance.
set to 1
Diag.WD_ON
If this bit is set to 1, the watchdog timer is activated.
Diag.freeze_mode
This bit is set by the DP slave when it receives the Freeze command.
Sync_mode
This bit is set by the DP slave when it receives the Sync command.
Diag.Not_Present
This bit is set by the DP master for the DP slaves not contained in the master parameter block. The DP slave sets this bit to zero.
Diag.deactivated
This bit is set by the DP master when the DP slave is removed from the master parameter block of the DP master. The DP slave always sets this bit to zero.

Fig. 19 Standard diagnostic information Byte 1

Byte 2

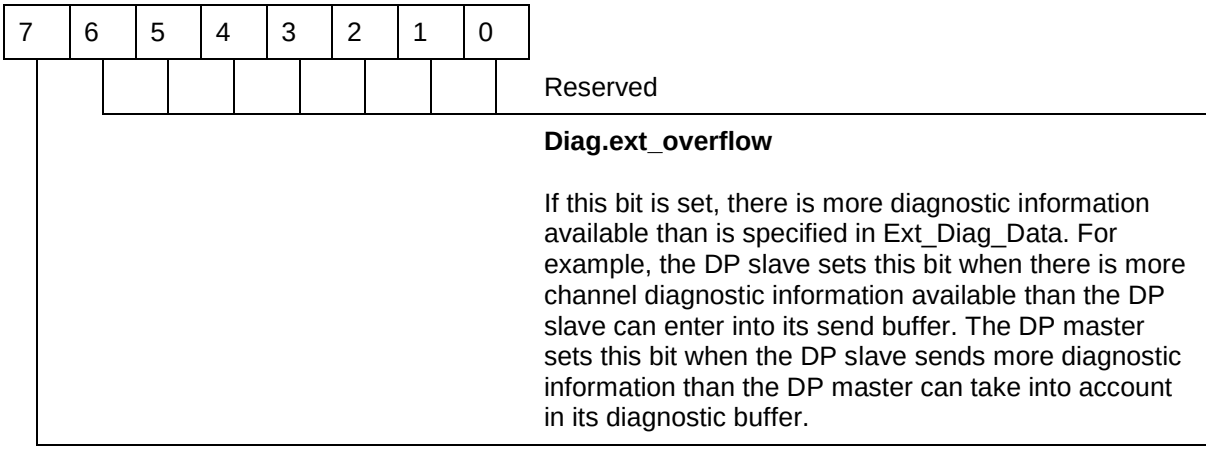

7
6
5
4
3
2
1
0
Reserved
Diag.ext_overflow
If this bit is set, there is more diagnostic information available than is specified in Ext_Diag_Data. For example, the DP slave sets this bit when there is more channel diagnostic information available than the DP slave can enter into its send buffer. The DP master sets this bit when the DP slave sends more diagnostic information than the DP master can take into account in its diagnostic buffer.

Fig. 20 Standard diagnostic information Byte 2

Byte 3

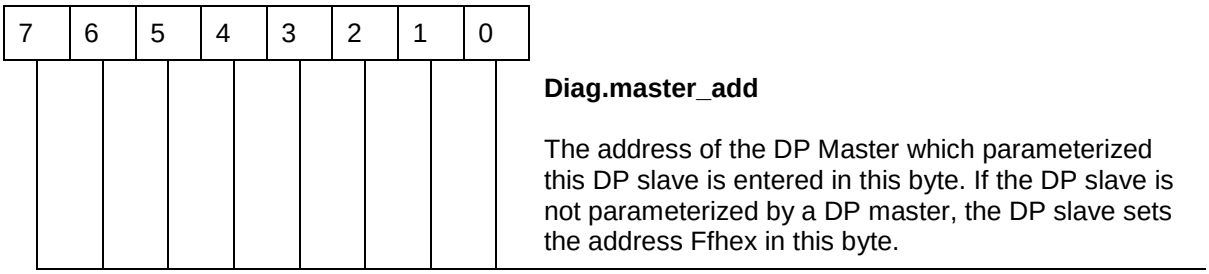

7
6
5
4
3
2
1
0
Diag.master_add
The address of the DP Master which parameterized this DP slave is entered in this byte. If the DP slave is not parameterized by a DP master, the DP slave sets the address Ffhex in this byte.

Fig. 21 Standard diagnostic information Byte 3

Byte 4

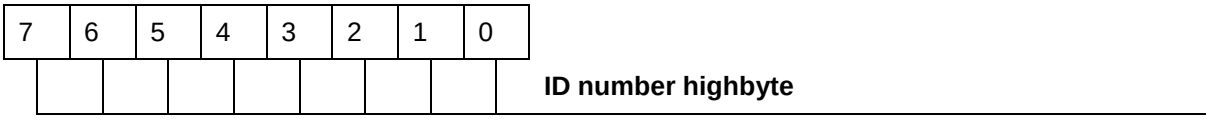


Fig. 22 Standard diagnostic information Byte 4

Byte 5

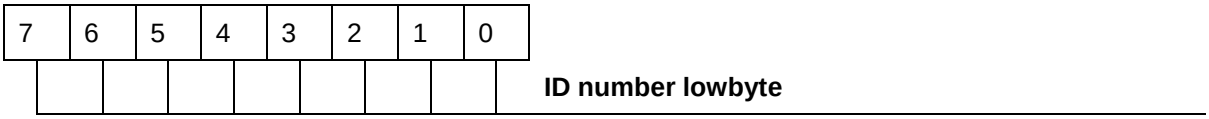


Fig. 23 Standard diagnostic information Byte 5

4.2.2 Identification-Related Diagnostic

Identification-related diagnostic bytes 6 to 14

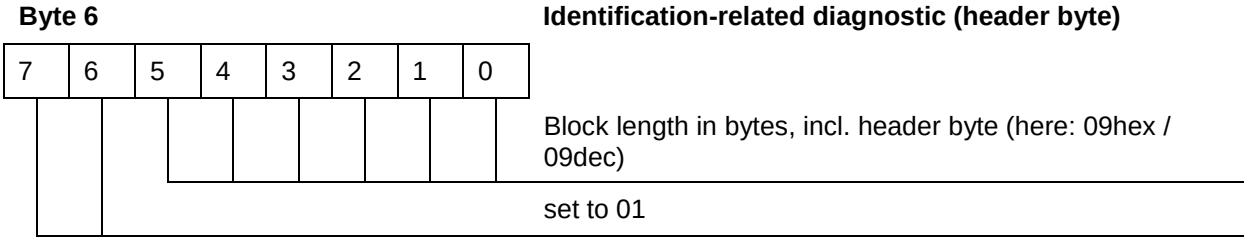

Byte 6
Identification-related diagnostic (header byte)
7 6 5 4 3 2 1 0
Block length in bytes, incl. header byte (here: 09hex / 09dec)
set to 01

Fig. 24 Identification-related diagnostic Byte 6

Byte 7: ID-related diagnostic for Slots 1 to 8:

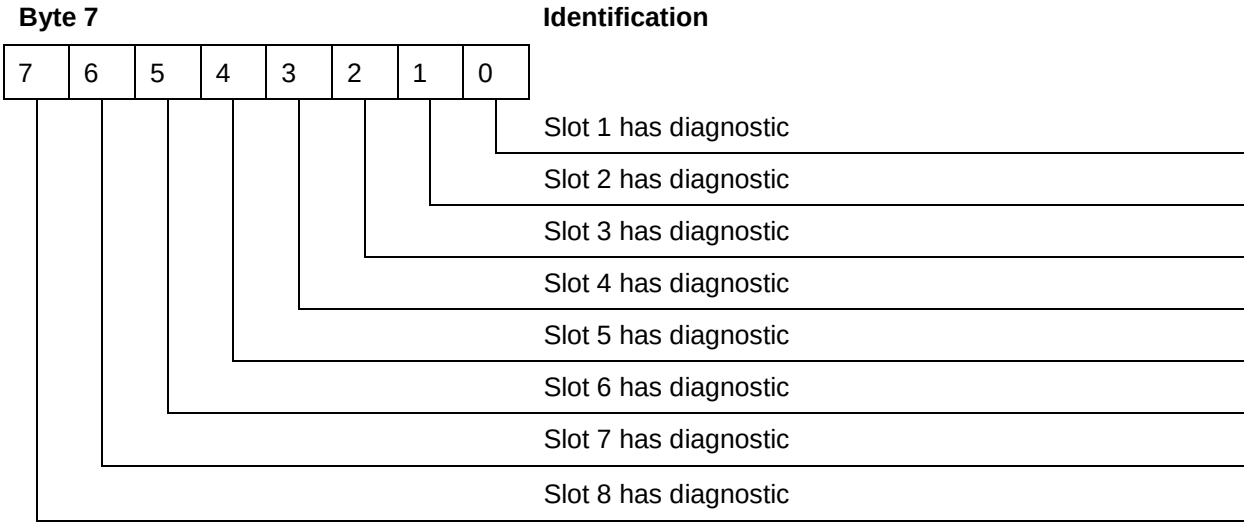


Fig. 25 Identification-related diagnostic Byte 7

Bit assignment of Byte 8 to 14:

Byte 8:	**Slot 9 ... 16**
Byte 9	**Slot 17 ... 24**
Byte 10	**Slot 25 ... 32**
Byte 11	**Slot 33 ... 40**
Byte 12	**Slot 41 ... 48**
Byte 13	**Slot 49 ... 56**
Byte 14	**Slot 57 ... 64**

4.2.3 Device-Related Diagnostic

Device-related diagnostic Bytes 15 to 34

Byte 15 **D**evice-related diagnostic (header byte)

7	6	5	4	3	2	1	0

Block length in bytes, incl. header byte (here: 14hex / 20dec)

set to 00

Fig. 26 Device-related diagnostic Byte 15

Byte 16 **Type of module status**

7	6	5	4	3	2	1	0

Unused

Set to 1 for module state

Unused

Unused

Unused

Unused

Unused

Set to 1 for status block

Fig. 27 Device-related diagnostic Byte 16

Byte 17 **Slot number**

7	6	5	4	3	2	1	0

Set to 0 since all diagnostics are reported to the bus node slot.

Fig. 28 Device-related diagnostic Byte 17

Byte 18 **Status Specification**

7	6	5	4	3	2	1	0

Set to 0 since it is not further differentiated.

Fig. 29 Device-related diagnostic Byte 18

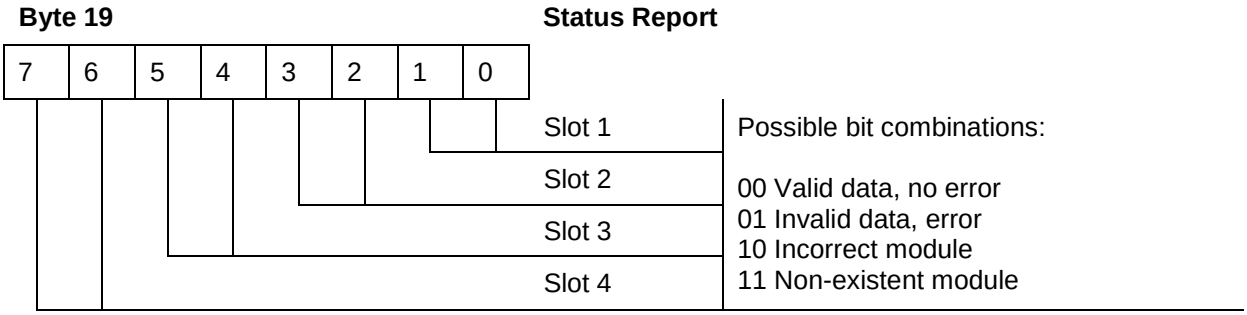


Fig. 30 Device-related diagnostic Byte 19

Bit assignment of Byte 20 to 34:

Byte 20:	Device-related diagnostic for Slots 5 to 8
Byte 21:	Device-related diagnostic for Slots 9 to 12
Byte 22:	Device-related diagnostic for Slots 13 to 16
Byte 23:	Device-related diagnostic for Slots 17 to 20
Byte 24:	Device-related diagnostic for Slots 21 to 24
Byte 25:	Device-related diagnostic for Slots 25 to 28
Byte 26:	Device-related diagnostic for Slots 29 to 32
Byte 27:	Device-related diagnostic for Slots 33 to 36
Byte 28:	Device-related diagnostic for Slots 37 to 40
Byte 29:	Device-related diagnostic for Slots 41 to 44
Byte 30:	Device-related diagnostic for Slots 45 to 48
Byte 31:	Device-related diagnostic for Slots 49 to 52
Byte 32:	Device-related diagnostic for Slots 53 to 56
Byte 33:	Device-related diagnostic for Slots 57 to 60
Byte 34:	Device-related diagnostic for Slots 61 to 64

4.2.4 Channel-Related Diagnostic

Channel-related diagnostic Bytes 35 to 37 and following

Three bytes are assigned in the diagnostic telegram for each channel-related diagnostic. If, for example, 5 channel-related diagnostics are available, a total of 5 times 3 bytes of channel-related diagnostic information follow.

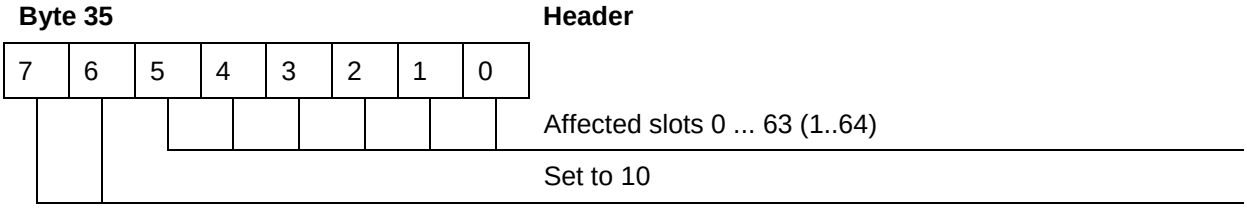


Fig. 31 Channel-related diagnostic Byte 35

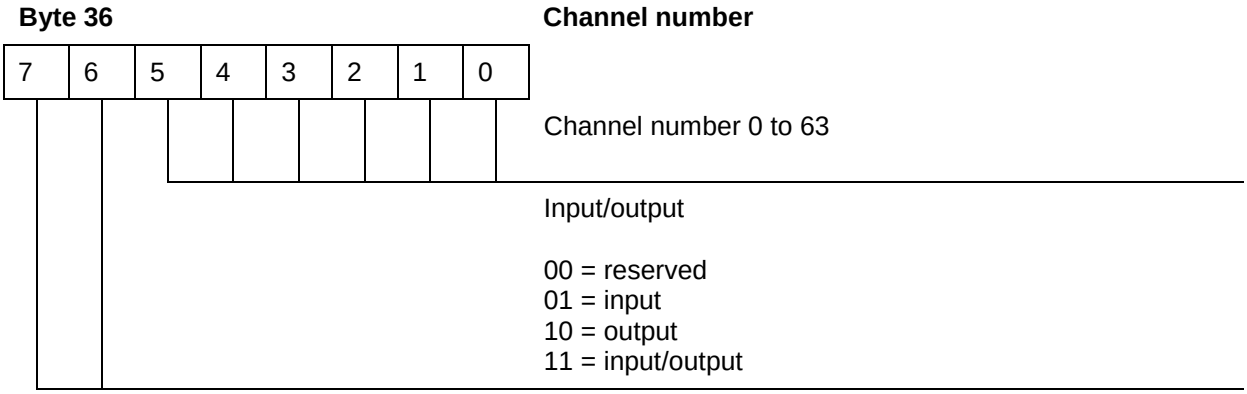


Fig. 32 Channel-related diagnostic Byte 36

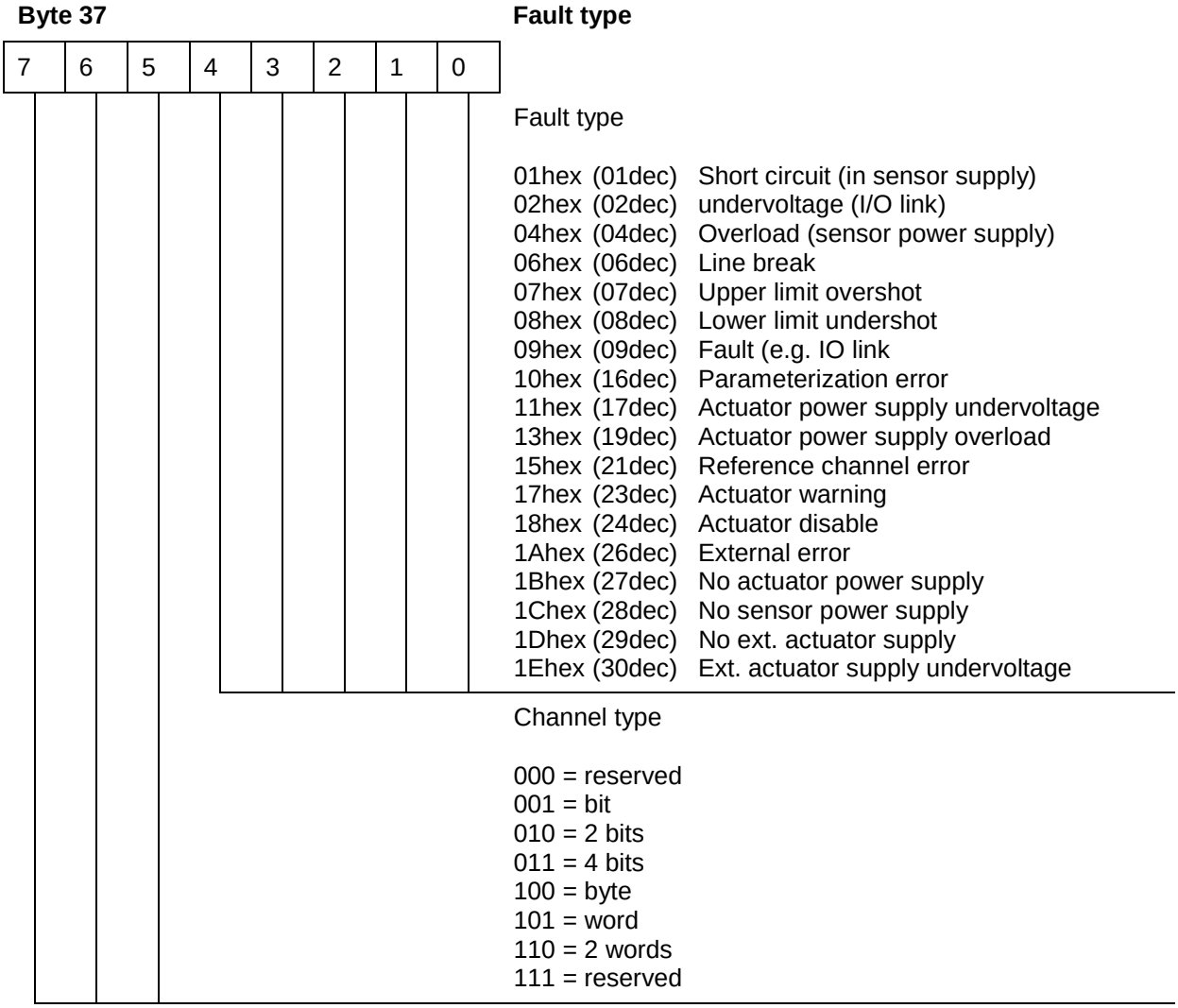

Byte 37
Fault type
7 6 5 4 3 2 1 0
Fault type
01hex (01dec) Short circuit (in sensor supply)
02hex (02dec) undervoltage (I/O link)
04hex (04dec) Overload (sensor power supply)
06hex (06dec) Line break
07hex (07dec) Upper limit overshot
08hex (08dec) Lower limit undershot
09hex (09dec) Fault (e.g. IO link
10hex (16dec) Parameterization error
11hex (17dec) Actuator power supply undervoltage
13hex (19dec) Actuator power supply overload
15hex (21dec) Reference channel error
17hex (23dec) Actuator warning
18hex (24dec) Actuator disable
1Ahex (26dec) External error
1Bhex (27dec) No actuator power supply
1Chex (28dec) No sensor power supply
1Dhex (29dec) No ext. actuator supply
1Ehex (30dec) Ext. actuator supply undervoltage
Channel type
000 = reserved
001 = bit
010 = 2 bits
011 = 4 bits
100 = byte
101 = word
110 = 2 words
111 = reserved

Fig. 33 Channel-related diagnostic Byte 37

4.3 Troubleshooting

If incorrect modules are reported, eliminate the failures in ascending order of slots.

Diagnostic Message		Possible Cause	Action
Channel	Short circuit (sensor supply)	Overload or short-circuit of sensor power supply to 0V.	Check cable to sensor or check sensor for short-circuit and if necessary replace it.
		Overload or short-circuit of internal system connection (channel type = 000)	Check cables on associated line
	Undervoltage IO Link	IO link undervoltage (event 0x5100-0x5119)	Check cable to sensor.
	Overload	Current load on a line greater than 4 A and less than 4.4 A (100-110%)	Check current load and possibly distribute to other lines.
	I/O link overload	I/O link overload (event 0x5410)	Check current load.
	Line break	Defective line. Analog inputs and analog outputs only	Check connection to sensor or sensor itself.
	Line break I/O link	I/O link device not plugged in or incorrect (invalid data length, cycle time too short, etc.)	Check connection to IO link device. Check data length. Increase cycle time in parameters.
	Upper limit overshot	Analog input measuring range overshot.	Check connection to sensor or sensor itself.
	Upper limit overshot (I/O link)	IO link event 0x8C10, 0x8C20	Check parameterization or measuring range
	Lower limit undershot	Analog input measuring range undershot	Check connection to sensor or sensor itself.
	Lower limit undershot (I/O link)	I/O link event 0x8C30	Check parameterization or measuring range
	ERROR	I/O link fault not assignable to another fault	Check IO link devices or read out their event memories.
	Parameterization error	Parameterization incorrect	Check parameterization
	Undervoltage actuator supply	Actuator supply < 18V	Check power supply unit and cable.
	Reference channel fault	TH module KTY not plugged in	Install KTY correctly

Diagnostic Message		Possible Cause	Action
	Actuator warning	External power supply to an output.	Check cable.
	Actuator shutdown	Overload or short-circuit of output signal to 0V.	Check wiring or actuator.
	External Error	Desina diagnostic	Check sensor or wiring.
	No Actuator Supply	Actuator supply < 13 V	Check power supply unit and cable.
	No sensor supply	Sensor supply < 13 V	Check power supply unit and cable.
	No external actuator supply	External actuator supply < 13 V	Check power supply unit and cable.
	Ext. actuator supply undervoltage	Actuator supply < 18V	Check power supply unit and cable.

Tab. 13 Troubleshooting

5 DP-V1 Support for Cube67+ BN-P

Cube67+ BN-P Art. No. 56521 currently supports DP-V1 for each Master Class 1 and Master Class 2 access. Below is an overview of supported indices.

5.1 Supported DP-V1 Indices

5.1.1 Index 10 "Machine Options Management"

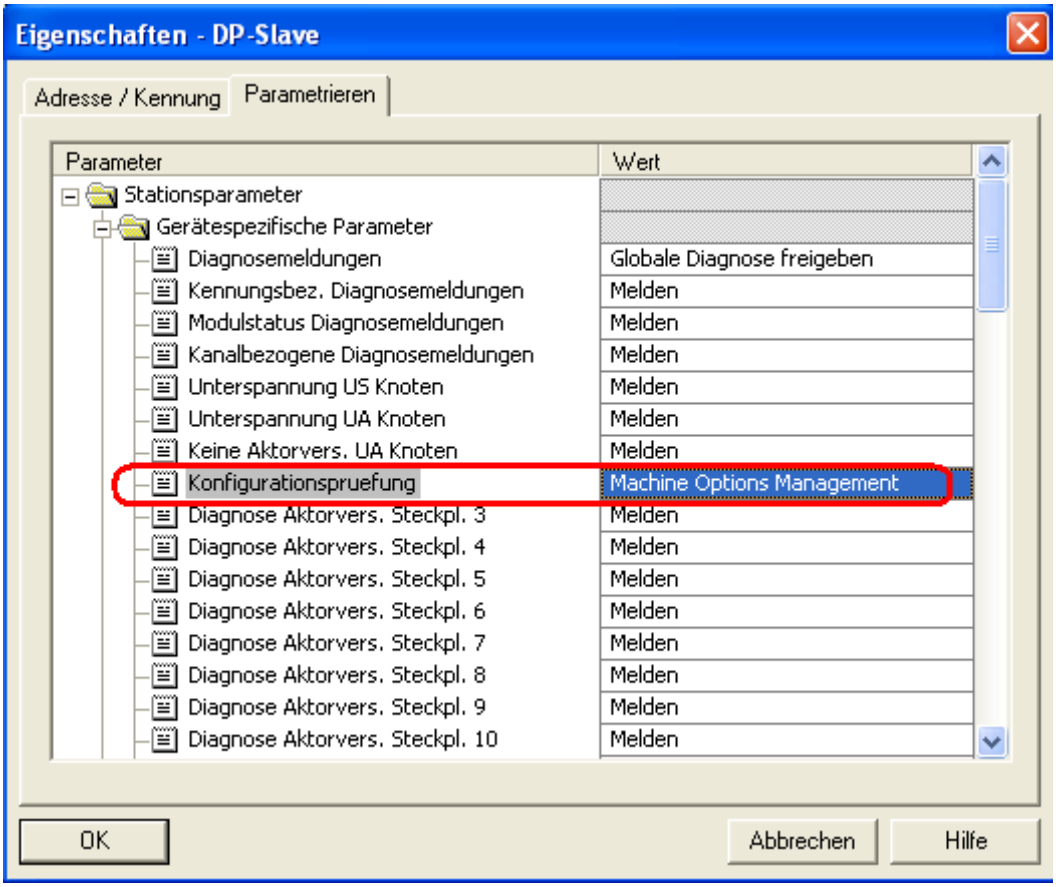


Fig. 34 Configuration test within the parameter list

Slots 3 to 64 can be enabled or disabled in 8 bytes, provided "Machine Options Management" is parameterized. Slots 1 (bus node) and 2 (Line0) cannot be disabled.

Byte0 to Byte7 must always be written

Byte 0 Disable Slots 3 to 8:

Bit	State	Meaning
0	Reserved	
1	Reserved	
2	0	Slot 3 enabled
	1	Slot 3 disabled
3	0	Slot 4 enabled
	1	Slot 4 disabled
4	0	Slot 5 enabled
	1	Slot 5 disabled
5	0	Slot 6 enabled
	1	Slot 6 disabled
6	0	Slot 7 enabled
	1	Slot 7 disabled
7	0	Slot 8 enabled
	1	Slot 8 disabled

Tab. 14 Assignment of Byte 0

Corresponds to:

Byte 1: **Disables Slots 9 to 16**
Byte 2: **Disables Slots 17 to 24**
Byte 3: **Disables Slots 25 to 32**
Byte 4: **Disables Slots 33 to 40**
Byte 5: **Disables Slots 41 to 48**
Byte 6: **Disables Slots 49 to 56**
Byte 7: **Disables Slots 57 to 64**

Placeholders and lines may not be disabled. If an attempt is made to do this, a configuration error is displayed.

Write or read accesses in "Default configuration" receive the negative reply "Feature not supported".

Read accesses in "Machine Options Management" receive a positive reply. The reply contains the parameters that were written previously using Index 10.

If the configuration is invalid, Index 10 write accesses always receive a positive reply. If the configuration is valid after an Index 10 write access, every following Index 10 write access receives a negative reply with "State conflict".

If no valid configuration is set in "Machine Options Management", no "Static diagnostic" can be set in the system.

If "Machine Options Management" is set and there is still no valid configuration set, a diagnostic message "Non-existent module at Slot 1" is sent if the link to a module is lost. The system most be reset after the link problem is rectified.

If a further error occurs at Slot 1 in relation to the non-existent module, this error is NOT indicated in the default diagnostic but in the channel-specific diagnostic (see Fehler! Verweisquelle konnte nicht gefunden werden.**).**

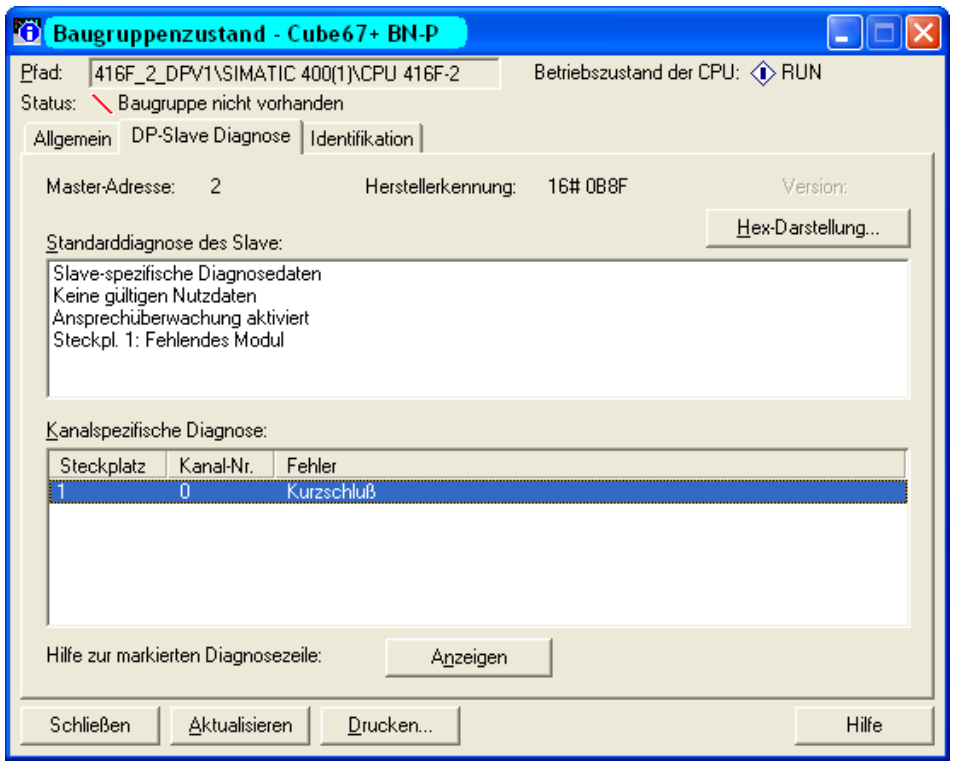


Fig. 35 Error display in default and channel-specific diagnostic

If "Machine Option Management" is set and the lines are disabled by DP-V1 Index 12, it may occur that the diagnostic message issued for non-existent modules may contain incorrect slot numbers.

For more details on "Machine Options Management", please refer to Chapter 6.

5.1.2 Index 12 "BusControl"

Byte 0 BusControl:

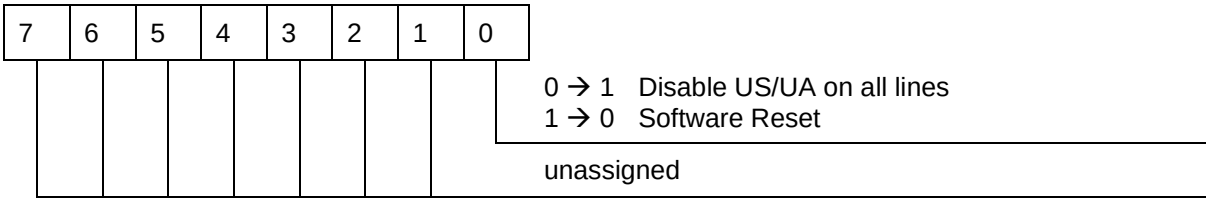


Fig. 36 BusControl byte DP-V1 Index 12

Through the interaction with the parameterization option of Machine Options Management, it is possible with help of the BusControl request (Bit 0: 0 → 1) to disable the US/UA voltages on all lines and then to change the setup of the CUBE67+ system. On completion of the conversion, a software reset in the bus node is triggered by a BusControl request (Bit 0: 1 → 0) and the new system configuration is scanned. Non-existent modules are then disabled from their max. configuration using an Index 10 access.

In addition, short-circuit messages from the lines can be reset after a BusControl request after rectification of an error without switching off the power supply of the Cube67+ BN-P manually, and then switching it back on.

Byte 1: UA control

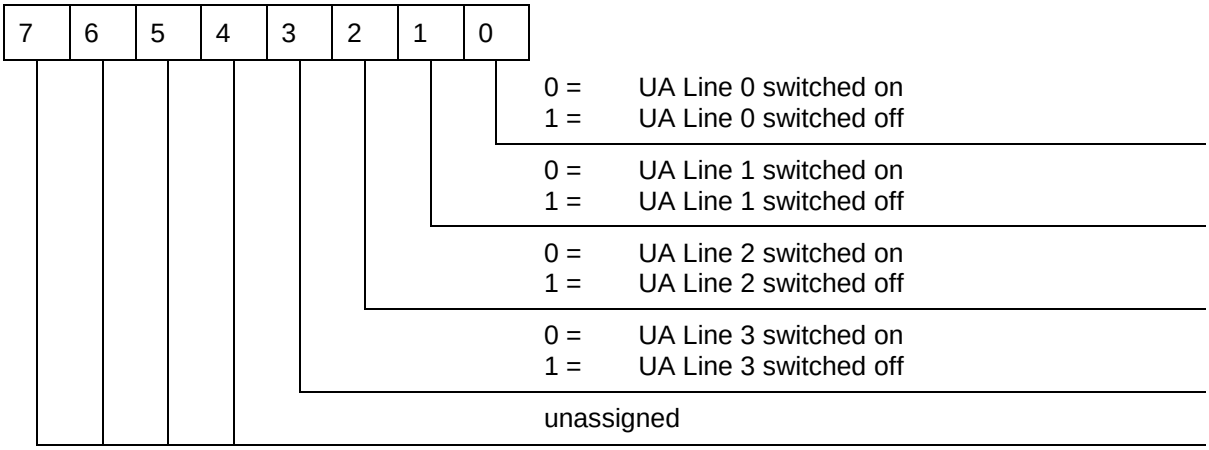


Fig. 37 UA control byte DP-V1 Index 12

Use the BusControl access to switch off and switch back on the actuator power supplies to the individual bus node lines via the PLC. A UA short-circuit or other fault that may be present can then be reset after rectification without resetting the complete bus node.

Byte0 and Byte1 must always be written.

5.1.3 Index 13 "Machine Options Management Configuration Test"

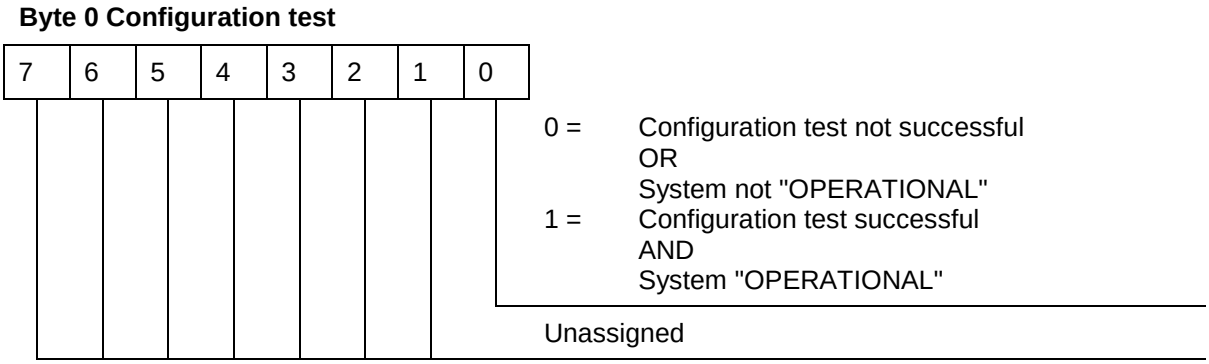


Fig. 38 Assignment of configuration test

A read access must be sent with Index 13 to know whether a valid configuration was set using Machine Options Management. Here, 1 is returned if the configuration is valid and the system status is "OPERATIONAL", otherwise 0.

If the bus node is parameterized with "Default configuration", the reply will be negative "Feature not supported".

Write accesses receive the negative reply "Feature not supported".

5.1.4 Index 255 Identification and Maintenance (I&M)

The bus node itself supports a read request to I&M Index 65000 (IM0) and the manufacturer-specific Index 65100. If other Cube67 (+) modules are connected to the bus nodes, these modules can then support additional I&M indices. Please refer the related module documentation.

5.1.4.1 IM0 (65000)

Content	Size	Content
Header		
Manufacturer-specific	10 bytes	Manufacturer-specific
I&M data		
MANUFACTURER_ID	2 bytes	012Fhex, 303dec
ORDER_ID	20 bytes	56521
SERIAL_NUMBER	16 bytes	DCC9hex, 56521dec
HARDWARE_REVISION	2 bytes	Hardware status (e.g. 0x0100)
SOFTWARE_REVISION	4 bytes	Software status (e.g. "2.0.0“)
REVISION_COUNTER	2 bytes	Revision counter (e.g. 0x00)
PROFILE_ID	2 bytes	F600hex
PROFILE_SPECIFIC_TYPE	2 bytes	0003hex
IM_VERSION	2 bytes	0111hex for V01.11
IM_SUPPORTED	2 bytes	0hex

Tab. 15 IM0 (65000)

5.1.4.2 IM100 (65100)

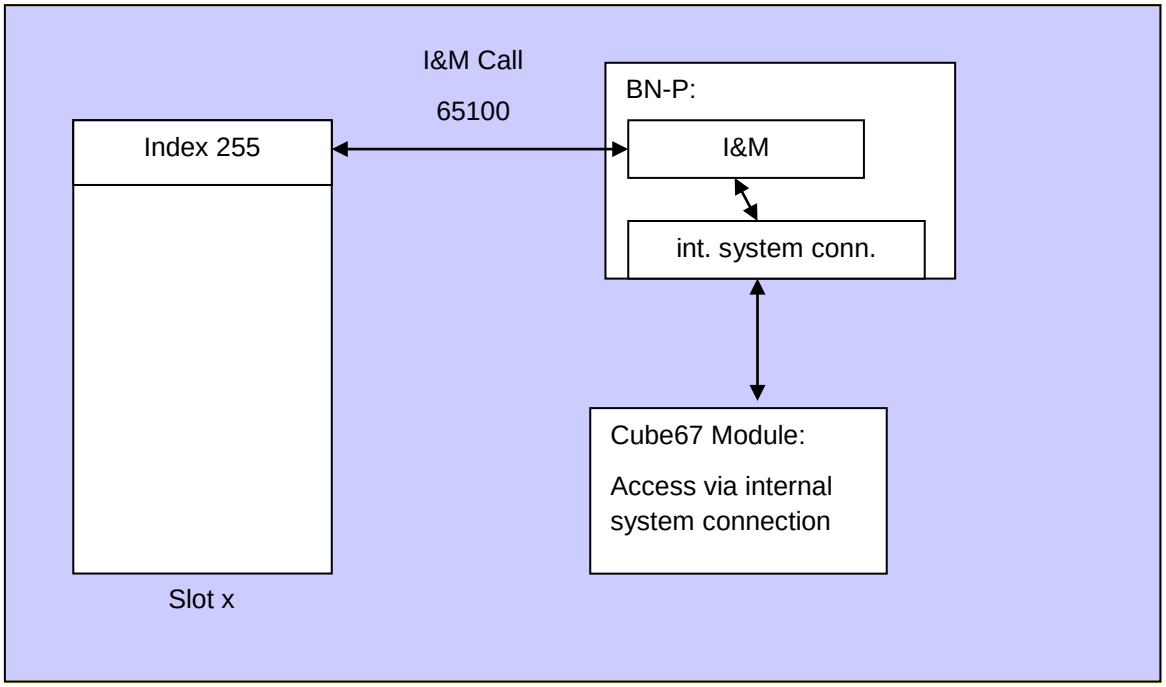


Fig. 39 IM100 access to Cube67+ BN-P or Cube67 modules

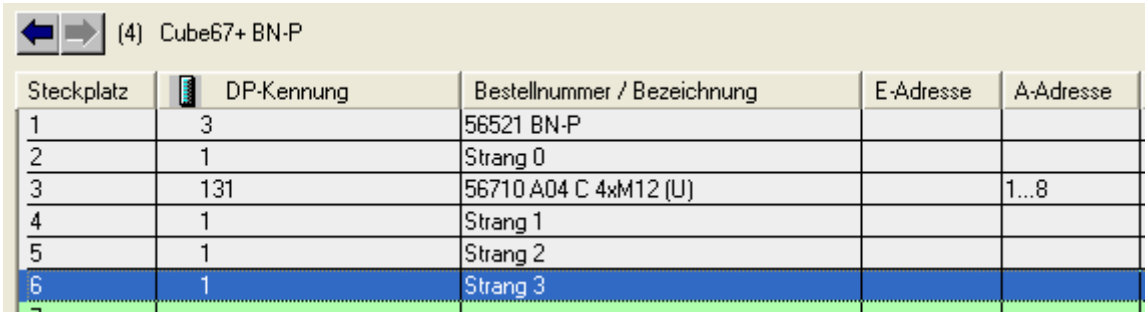
Using the manufacturer-specific I&M Index 65100 (IM100), you can send read or write requests to module parameter bytes.

If the outputs of an analog module are enabled or reparameterized using DP-V1 IM100 accesses, it is necessary to reset the output data to 0 during the access. On completion of reparameterization, the output data can be re-updated.

Example:

In the simple example below, we will show you how to disable a channel of an analog output module using two IM100 requests and enable another channel of the same module to switch a sensor off and switch another sensor on. This example was created using a Siemens controller. DP-V1 requests were handled using module that are available in the download section of the Murrelektronik website.

Configuration



Steckplatz	DP-Kennung	Bestellnummer / Bezeichnung	E-Adresse	A-Adresse
1	3	56521 BN-P		
2	1	Strang 0		
3	131	56710 A04 C 4xM12 (U)		1...8
4	1	Strang 1		
5	1	Strang 2		
6	1	Strang 3		

Fig. 40 Configuration example

Channel 0 of Module 56710 is enabled for the range 0 to 10 V.

The parameters in detail:

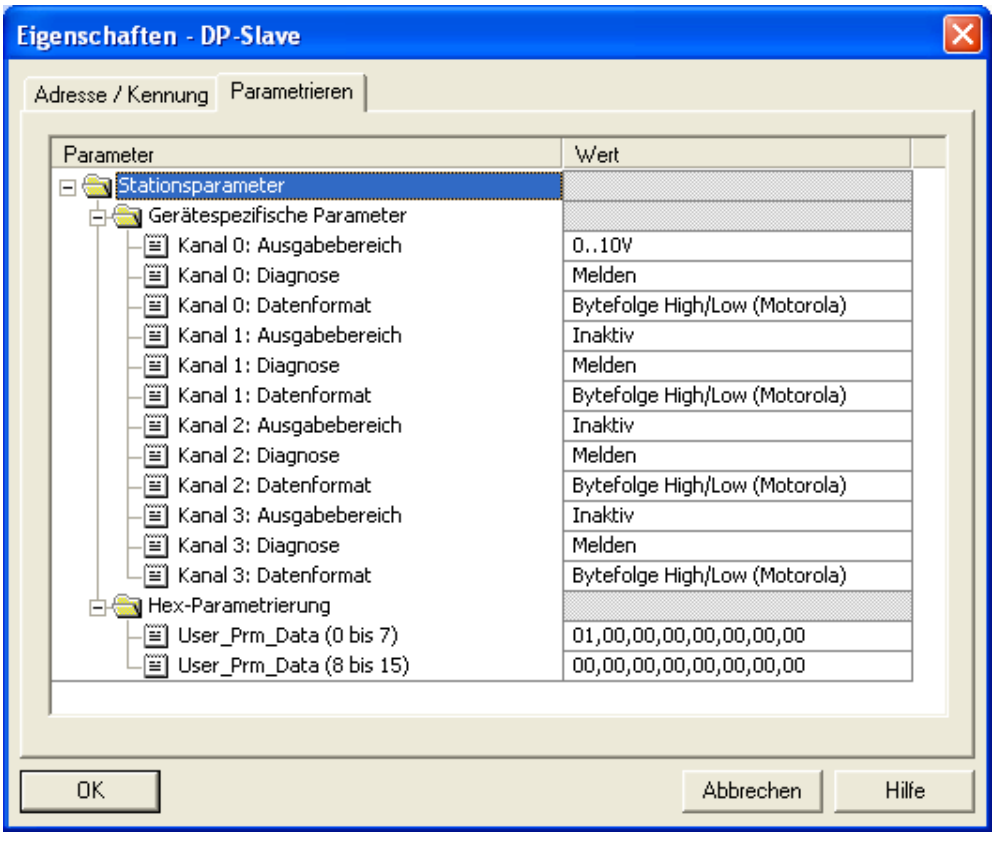


Fig. 41 Characteristics of the DP slave

The current hex parameterization of the module is 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00. This is also described in the parameter assignment of Module Art. No.56710 (excerpt from Cube67+ BN-P Manual (Art. No. 56980):

Bit assignment of parameter byte 0 (Channel 0), 4 (Channel 1), 8 (Channel 2), 12 (Channel 3)

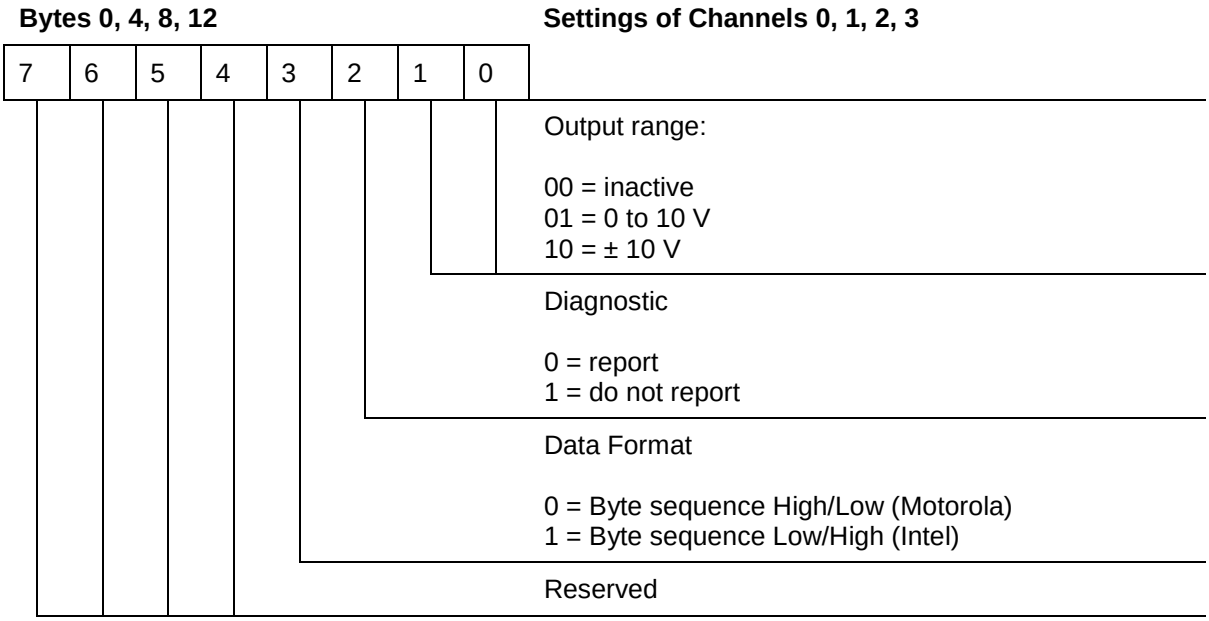


Fig. 42 *Bit assignment of parameter bytes 0, 4, 8, 12*

Disabling Channel 0 of Module Art. No. 56710

In order to change the module parameters using DP-V1, the DP-V1 Write Request is sent:

5F 03 FF 08 08 00 FE 4C A0 01 01 00

Meaning of the digits in detail (all hexadecimal):

5F	**Write Request**
03	Slot Number
FF	Number of used index (255dec = IM)
08	Number of useful data in bytes
08	Call Function
00	Reserved
FE 4C	(65100 dec) = IM100
A0 01	Index 20 01, here, the highest bit is set (2+8 = A), this means write access.
01	The first parameter byte (parameter byte 0) is processed.
00	The parameter to be written for the selected bytes:

After the write request, a reply telegram is sent containing the written data length.

According to the IM standard, this must be followed by a read request (without parameters).

5E 03 FF 08

Meaning of the numerals in detail (all hexadecimal):

5E	**Read Request**
03	Slot Number
FF	Number of used index (255dec = IM)
08	Number of useful data in bytes

The parameter change was successful; Channel 0 is now set to "disabled".

Enabling Channel 1 for the range 0 to 10 V

Value 1 must be set for parameter byte 4.

Telegram data in detail:

5F 03 FF 08 08 00 FE 4C A0 01 05 01

Meaning of the digits in detail (all hexadecimal):

5F	**Write Request**
03	Slot Number
FF	Number of used index (255dec = IM)
08	Number of useful data in bytes
08	Call Function
00	Reserved
FE 4C	(65100 dec) = IM100
A0 01	Index 20 01, here, the highest bit is set (2+8 = A), this means write access.
05	The 5th parameter byte (parameter byte 4) is processed.
01	The parameter to be written for the selected bytes:

According to the IM standard, this must be followed by a read request (without parameters).

The parameter change was successful; Channel 1 is now enabled for the range 0 to 10 V.

STEP7 libraries that contain modules for IM accesses are available in the download section of the Murrelektronik website:
www.murrelektronik.com

6 Machine Options Management

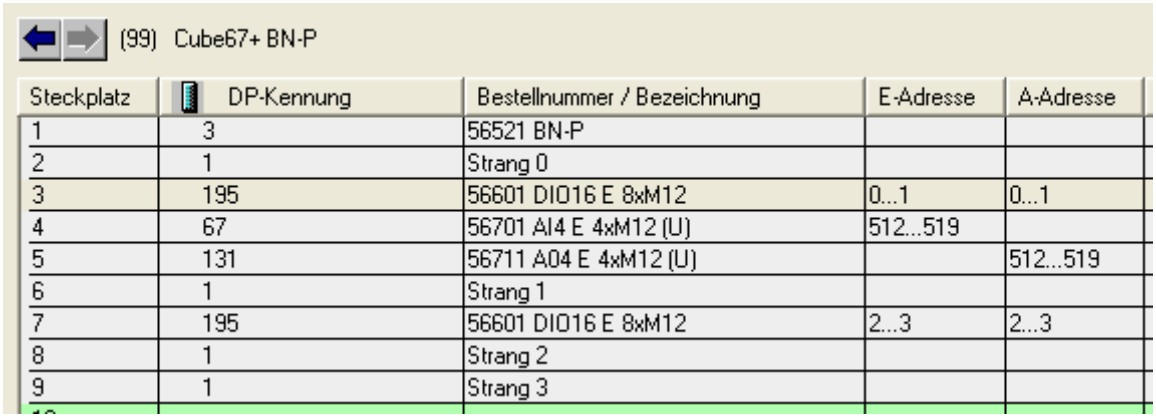
6.1 Maximum Configuration

The Machine Options Management helps you to carry out the modular configuration of machines. When a machine comprises a base module A and an optional machine module B, you can use the Machine Options Management to disable modules belonging to the – non-existent – machine module B.

This is done by configuring all modules in the configuration tool, even the optional modules of machine module B. This configuration is called the "Maximum Configuration". In addition, you can parameterize the "Configuration test" parameter of the bus node with "Machine Options Management". The system reports no error after run-up and this is totally independent of the received configuration or parameterization. The bus node reverts to data exchange, however, the data are not updated.

We will describe Machine Options Management by means of an example.

Here is the maximum configuration:


(99) Cube67+ BN-P

Steckplatz	DP-Kennung	Bestellnummer / Bezeichnung	E-Adresse	A-Adresse
1	3	56521 BN-P		
2	1	Strang 0		
3	195	56601 DIO16 E 8xM12	0...1	0...1
4	67	56701 AI4 E 4xM12 (U)	512...519	
5	131	56711 AO4 E 4xM12 (U)		512...519
6	1	Strang 1		
7	195	56601 DIO16 E 8xM12	2...3	2...3
8	1	Strang 2		
9	1	Strang 3		

Fig. 43 Maximum Configuration

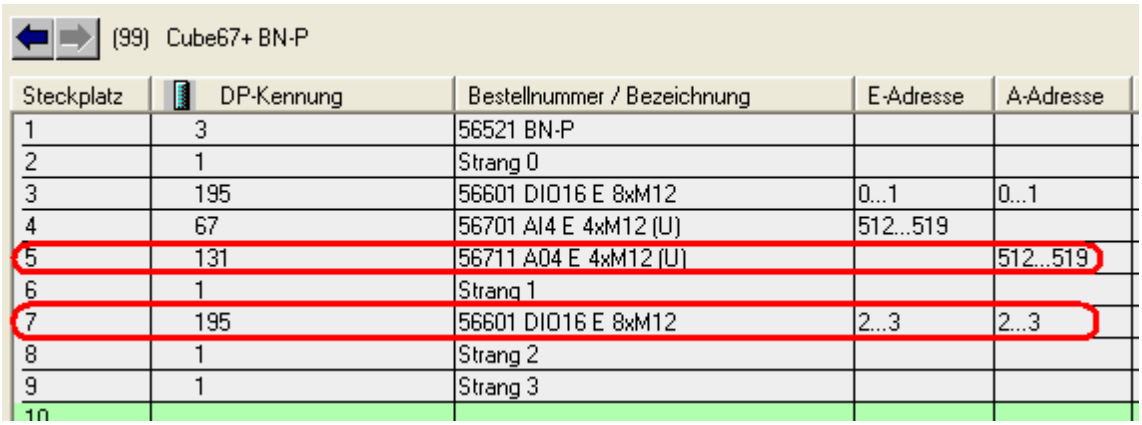
6.2 Selecting Modules and Setting a Configuration

If the system is in data exchange mode, set the configuration you require by disabling the slots of the unused modules by means of DP-V1 Index 10 ("Machine Options Management"). Refer to Section 5.1.1 for a detailed description. A configuration test then takes place in the system, i.e. the configuration set by Machine Options Management is compared with the real topology. If this test is successful, the configuration is valid and the system continues with data exchange. If the test is not successful, the configuration is invalid and a diagnostic is output (non-existent or incorrect module). The system is then no longer in data exchange mode - the static diagnostic bit is set.

The test result can be requested using DP-V1 Index 13 ("Machine Options Management Configuration Test"). You will find a detailed description of this in Section 5.1.3.

If an invalid configuration is detected, you can try and set a valid configuration using Machine Options Management.

In our example, only the modules in Slots 1, 3, and 4 really exist. Slots 2, 6, 8, and 9 are occupied by line modules that must be present. The modules in Slots 5 and 7 do not exist. They are disabled by write access with DP-V1 Index 10.



(99) Cube67+ BN-P

Steckplatz	DP-Kennung	Bestellnummer / Bezeichnung	E-Adresse	A-Adresse
1	3	56521 BN-P		
2	1	Strang 0		
3	195	56601 DIO16 E 8xM12	0...1	0...1
4	67	56701 AI4 E 4xM12 (U)	512...519	
5	131	56711 AO4 E 4xM12 (U)		512...519
6	1	Strang 1		
7	195	56601 DIO16 E 8xM12	2...3	2...3
8	1	Strang 2		
9	1	Strang 3		
10				

Fig. 44 Example of an invalid configuration

In the real setup, the red bordered modules are non-existent (Slots 5 and 7).

Telegram parameters in detail:

5F 00 0A 08 50 00 00 00 00 00 00 00

Meaning of the digits in detail (all hexadecimal):

5F	**Write Request**
00	Slot number (Slot 1)
0 A	Number of index used (10dec)
08	Number of useful data in bytes
50	1. Parameter byte (Parameter byte 0)
00	2. Parameter byte (Parameter byte 1)
…	...
00	8. Parameter byte (Parameter byte 7)

Bit pattern of parameter bytes:

Byte 0

Bit value:	0	1	0	1	0	0	0	0	→ Hex: 50
Slot number:	8	7	6	5	4	3	2	1	

Byte 1:

Bit value:	0	0	0	0	0	0	0	0	→ Hex: 00
Slot number:	16	15	14	13	12	11	10	9	

Bytes 2 to Byte 7 are also 0, like Byte 1.

The Write Request receives a positive reply telegram if it was successful. This is irrespective or whether the present configuration is valid or not.

6.3 Configuration Test

A DP-V1 read request with Index13 can test whether the configuration is valid.

Telegram parameters in detail:

5E 00 0D 01

Meaning of the digits in detail (all hexadecimal):

5E	Read Request
00	Slot Number
0D	Number of index used (13dec)
01	Number of useful data in bytes

If "Machine Options Management" is a configuration test, this results in a positive reply telegram that looks like this:

5E 00 0D 01 01 (valid configuration exists and system is OPERATIONAL), or 5E 00 0D 01 00 (invalid configuration, or system is not OPERATIONAL).

If the configuration is valid, the system reverts to active data exchange. If diagnostics are received, they are displayed, provided they were not disabled in the bus node parameters.

If the configuration is invalid, the system does not revert to active data exchange. Instead, the static diagnostic is set and a slot error is displayed.

In our example, the configuration is valid. The system is now in data exchange mode.

If a valid configuration is set, it is non longer possible to set another configuration using Index 10. A negative reply telegram is sent.

To find out what parameters were sent using Index 10, a Read Request can also be set to Index 10 and it returns the written parameters. If nothing was written, zeros are returned.

If the bit is set for an unused slot, this bit is ignored. Example: Slots 1 to 9 are assigned and the mask 00 00 02 00 00 00 00 00 is set (= Slot 18 is disabled).

6.4 Changing a Module

If you want to change modules, i.e. change your real setup, please proceed as follows:

1. **Disable all lines using Index 12 "Bus Control".**
2. **Replacing modules**
3. **Resetting the bus node using 12 "Bus Control"**
4. **Set a valid configuration using Index 10.**
5. **Test whether the configuration is valid.**

Example: Changing a Module

1. **Disable the lines using DP-V1 Index 12.**

Telegram parameters in detail:

5F 00 0C 02 01 00

Meaning of the digits in detail (all hexadecimal):

5F	Write Request
00	Slot number (Slot 1)
0C	Number of index used (12dec)
02	Number of useful data in bytes
01	1. Parameter byte (BusControl): Disable US/UA on all lines.
00	2. Parameter byte (UA control)

Now UA/US are disabled. The system indicates a configuration error. When they are within the normal range, the bus node US and UA LEDs are green and the line US and UA LEDs are disabled.

2. **Replacing modules**

Modules 56601 and 56701 on Line 0 are removed; one Module 56601 is connected to Line 1.

3. **Resetting the bus node using 12 "Bus Control"**

Telegram parameters in detail:

5F 00 0C 02 00 00

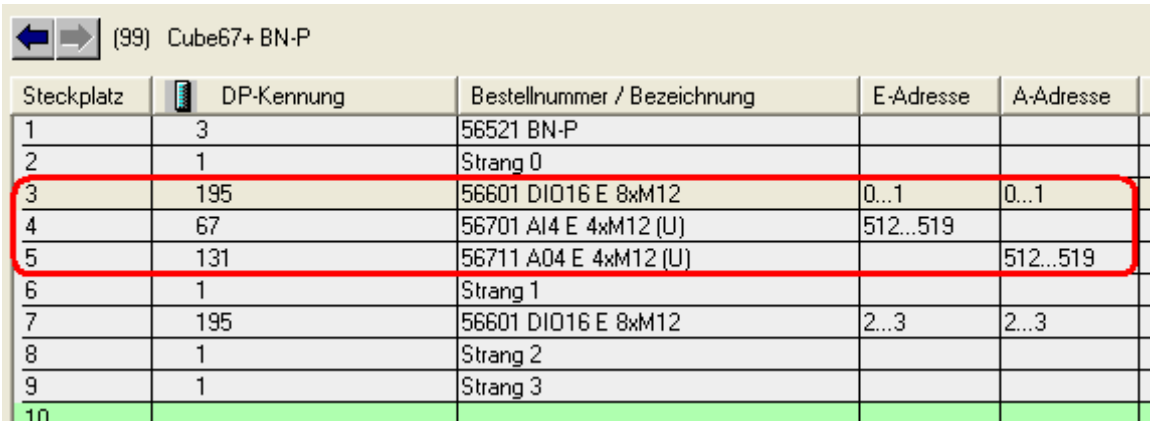
Meaning of the digits in detail (all hexadecimal):

5F	Write Request
00	Slot number (Slot 1)
0C	Number of index used (12dec)
02	Number of useful data in bytes
00	1. Parameter byte (BusControl): Reset the bus node.
00	2. Parameter byte (UA control)

The system then reports no error after run-up. The bus node reverts to data exchange, however, the data are not updated.

4. **Setting a valid configuration using Index 10**

Since only the 56601 is connected to Line 1, Slots 3, 4, and 5 of the non-existent modules are disabled using DP-V1 Index 10 Write Access.


(99) Cube67+ BN-P

Steckplatz	DP-Kennung	Bestellnummer / Bezeichnung	E-Adresse	A-Adresse
1	3	56521 BN-P		
2	1	Strang 0		
3	195	56601 DIO16 E 8xM12	0...1	0...1
4	67	56701 AI4 E 4xM12 (U)	512...519	
5	131	56711 AO4 E 4xM12 (U)		512...519
6	1	Strang 1		
7	195	56601 DIO16 E 8xM12	2...3	2...3
8	1	Strang 2		
9	1	Strang 3		
10				

Fig. 45 Example of changing modules

Telegram parameters in detail:

5F 00 0A 08 1C 00 00 00 00 00 00 00

Meaning of the digits in detail (all hexadecimal):

5F	**Write Request**
00	Slot number (Slot 1)
0 A	Number of index used (10dec)
08	Number of useful data in bytes
1C	1. Parameter byte (Parameter byte 0)
00	2. Parameter byte (Parameter byte 1)
…	...
00	8. Parameter byte (Parameter byte 7)

Bit pattern of 1st parameter byte:

Byte 0

Bit value:	0	0	0	1		1	1	0	0 → Hex: 1C
Slot number:	8	7	6	5		4	3	2	1

5. Test whether the configuration is valid.

Now a test can be made using DP-V1 V1 read request with Index13 whether the configuration is valid. If this is the case, the system is in data exchange mode. The module change was successful.

7 Technical Data of Cube67+ BN-P Art. No. 56521

7.1 Signal Delay of Digital Inputs and Outputs

Number of I/O Modules	Bus Node Delay	Module Delay	Total Delay
1 to 32	2 ms	2 … 4 ms	4 … 6 ms

Tab. 16 Signal delay of digital inputs and outputs

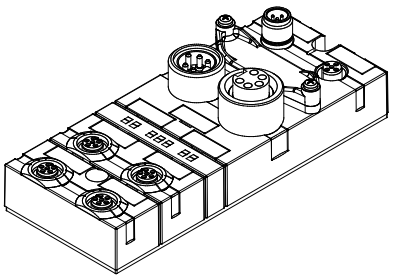
7.2 Signal Delay of Analog Inputs and Outputs

Number of I/O Modules	Bus Node Delay	Module Delay	Total Delay
1 to 32	2 ms	2 … 10 ms	4 … 12 ms

Tab. 17 Signal delay of analog inputs and outputs

7.3 Technical Data

Profibus Slave IP67



EMC

EN 61131-2 Product standard

EN 61000-4-2 ESD ..... Contact ± 4 kV, air ± 8 kV
EN 61000-4-3 RF-Field & GSM..... 10 V/m
EN 61000-4-4 Burst .....± 2 kV
EN 61000-4-5 Surge ..... asym./sym. ± 500 V (DC input)
..... asym. ± 1 kV (Signal connections)
EN 61000-4-6 HF-asymmetric ..... 10 V
EN 61000-4-8 Magnetic field 50 Hz ..... 30 A/m
EN 55011 Emission..... QP 40 dBµV/m (30 ... 230 MHz)
..... QP 47 dBµV/m (230 ... 1000 MHz) (class A)

Ambient Conditions

Normal operating temperature ..... 0°C to +55°C
Storage temperature ..... -25°C to +85°C
Enclosure type according to EN 60529 ..... IP 67

Please note:

The Cube67 field bus system is very robust and, due to the high protection class IP67, it is protected from dust, dirt, and most liquids without an additional housing. Cube 67 is specially designed for tough industrial applications directly in machines and systems.

The field bus system is not suitable for outdoor use, continuous operation in liquids, or high pressure wash downs.

Mechanical Ambient Conditions

Oscillation according to EN 60068 Part 2-6 ..... 5 – 70 Hz; const. amplitude 0.75 mm
..... 70 – 500 Hz; const. acceleration 15 g
Shock according to EN 60068 Part 2-27 ..... Amplitude 50 g, 11 ms duration

Connection Possibilities

Supply cable ..... Plug connector 7/8"
Bus connection..... M12 connector 5-pin
..... (Reverse-Key coding)
Internal system connection..... 4 x 6-pin M12 plug connector

Miscellaneous

Dimensions (LxWxH) in mm ..... 151x62x40.5 mm
Weight ..... Approx. 350 g

Bus Data

Transfer protocol ..... Profibus-DP acc. to DIN 19245
Transfer rates 9.6/19.2/45.45/93.75/187.5/500/
..... 1500/3000/6000/12000 kBaud
Baud rate recognition ..... automatic
Modes ..... Sync mode, Freeze mode are supported
Addressing ..... 0 to 99 with BCD rotary switch
ID number ..... 08BF hex

Power Supply

Operation voltage US and sensor power supply 24 VIN.... 24 VDC (must always be connected)
Actuator power supply 24 V ..... 24 VDC
Current per PIN ..... Max 8 A
Operation voltage range ..... 18 to 30 VDC
Current consumption ..... <= 120 mA
Sensor supply..... 24 VDC (not switchable)
Operating voltage range sensor supply..... 18 to 30 VDC
Actuator power supply..... 24 VDC (switchable)
Operating voltage range actuator supply ..... 18 to 30 VDC
Reverse voltage protection module electronics ..... yes
Reverse voltage protection sensor power supply ..... yes
Reverse voltage protection actuator power supply ..... yes
Overvoltage protection ..... yes (suppressor diode)

International System Connection

Rated current sensor power supply ..... 4 A for each module plug-in location
Rated current actuator power supply ..... 4 A for each module plug-in location
Overload/short-circuit ..... electronic short-circuit recognition
..... Time of liberation < 10 ms

8 Cube67+ Modules

8.1 Cube67+ DIO12 IOL4 E 8xM12 Art. No. 56752

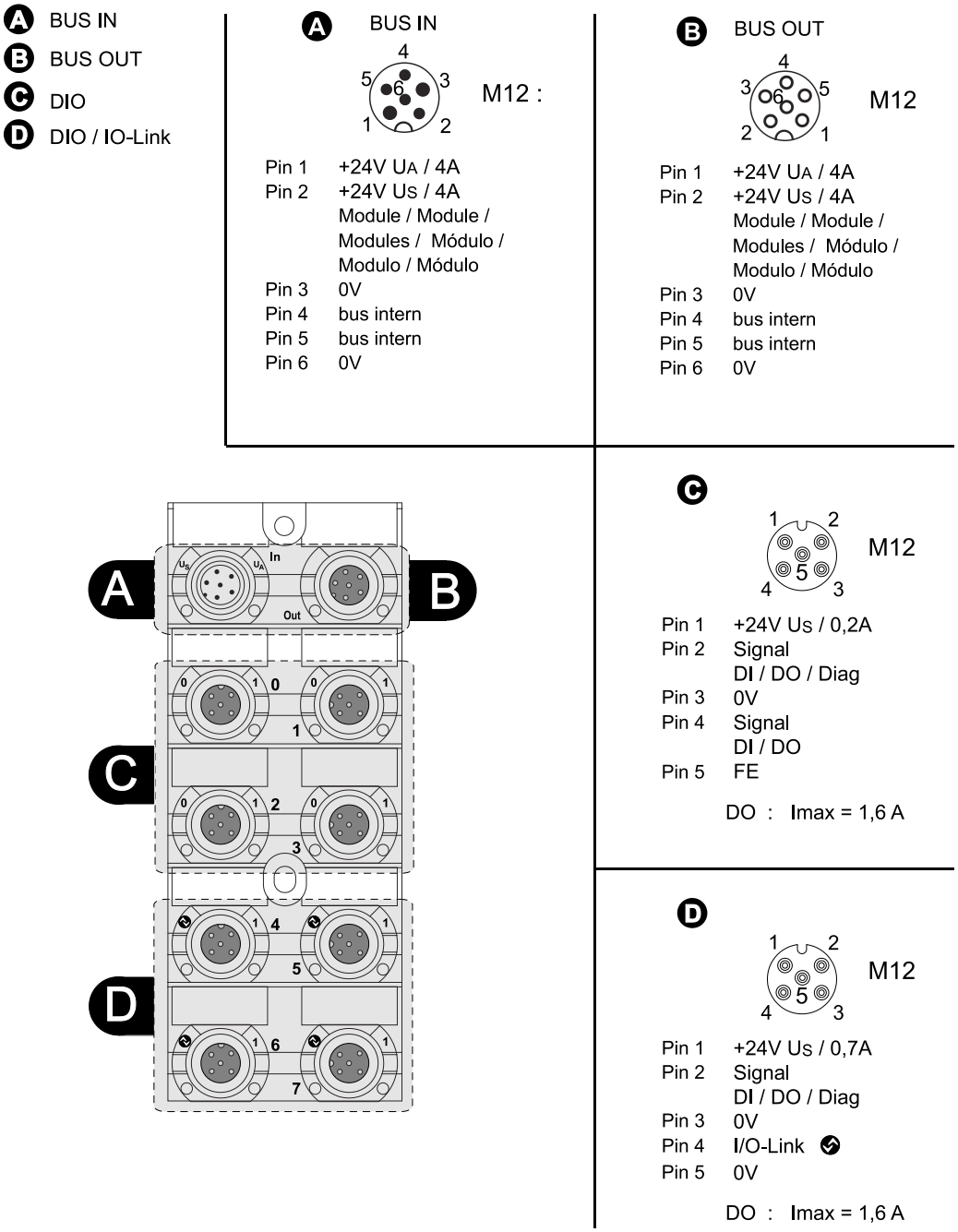


Fig. 46 Pin assignment and terminal overview

8.1.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
Cube67+ DIO12 IOL4 E 8xM12	56752	2 bytes	2 bytes	$C3_{hex}$ 01_{hex} 01_{hex} DD_{hex} $B0_{hex}$ 06_{hex}

Tab. 18 Identification Art. No. 56752

The complete identification of the Cube67+ DIO12 IOL4 E 8xM12 is composed of the above listed identification and 4 following identifications for 4 virtual I/O link modules. Please refer to the associated GSD file for the identifications of the IO link modules.

8.1.2 Baud Rates

The four IO link masters of CUBE67+ DIO12 IOL4 E 8xM12 Art. No. 56752 support all three IO link baud rates according to IO Link Communication Specification 1.0

8.1.3 Parameters

Number of parameter bytes: 18

Bit assignment of parameter Byte 0

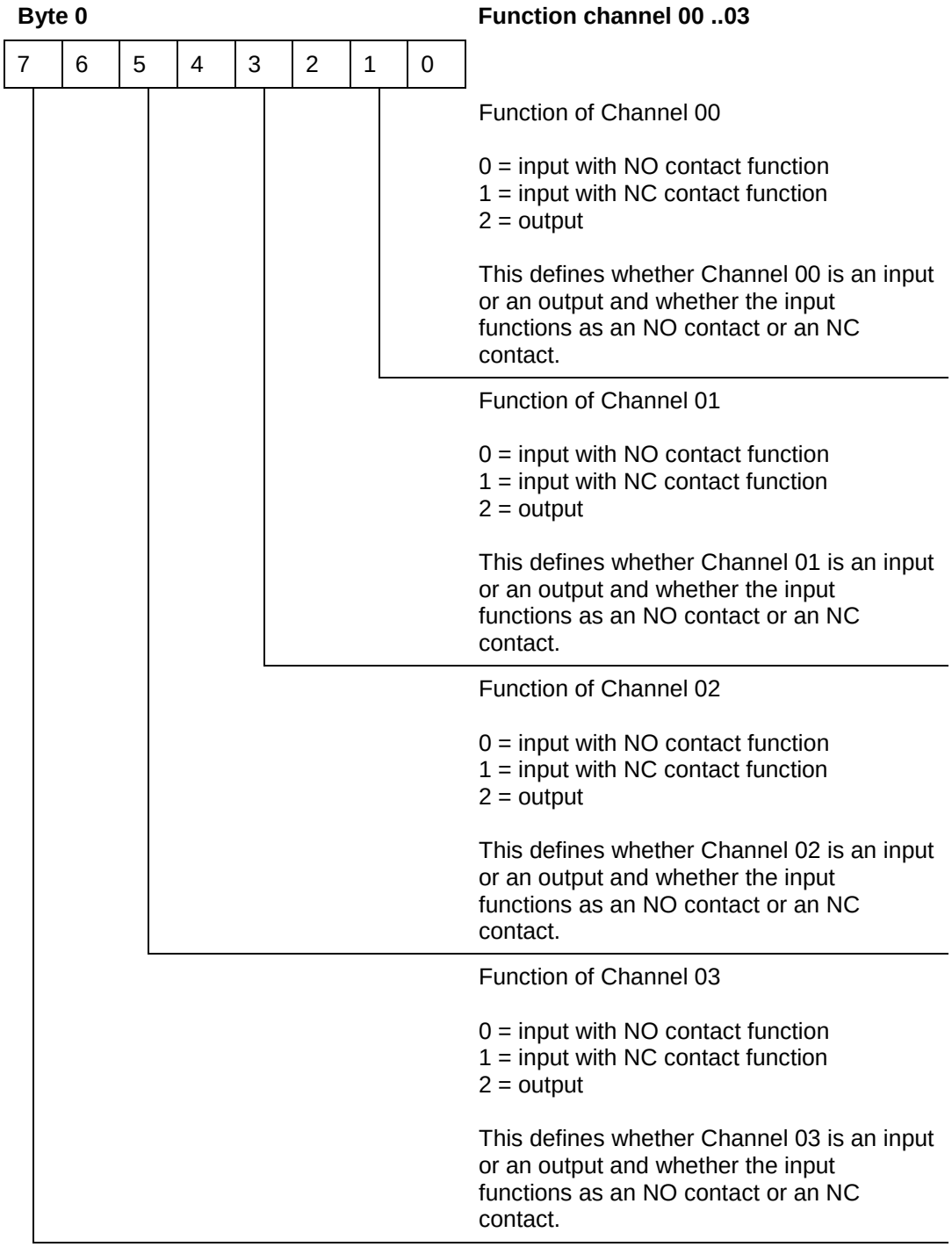

Byte 0
Function channel 00 ..03
7
6
5
4
3
2
1
0
Function of Channel 00
0 = input with NO contact function
1 = input with NC contact function
2 = output
This defines whether Channel 00 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 01
0 = input with NO contact function
1 = input with NC contact function
2 = output
This defines whether Channel 01 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 02
0 = input with NO contact function
1 = input with NC contact function
2 = output
This defines whether Channel 02 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 03
0 = input with NO contact function
1 = input with NC contact function
2 = output
This defines whether Channel 03 is an input or an output and whether the input functions as an NO contact or an NC contact.

Fig. 47 Parameter byte 0 Art. No. 56752

Bit assignment of parameter Byte 1

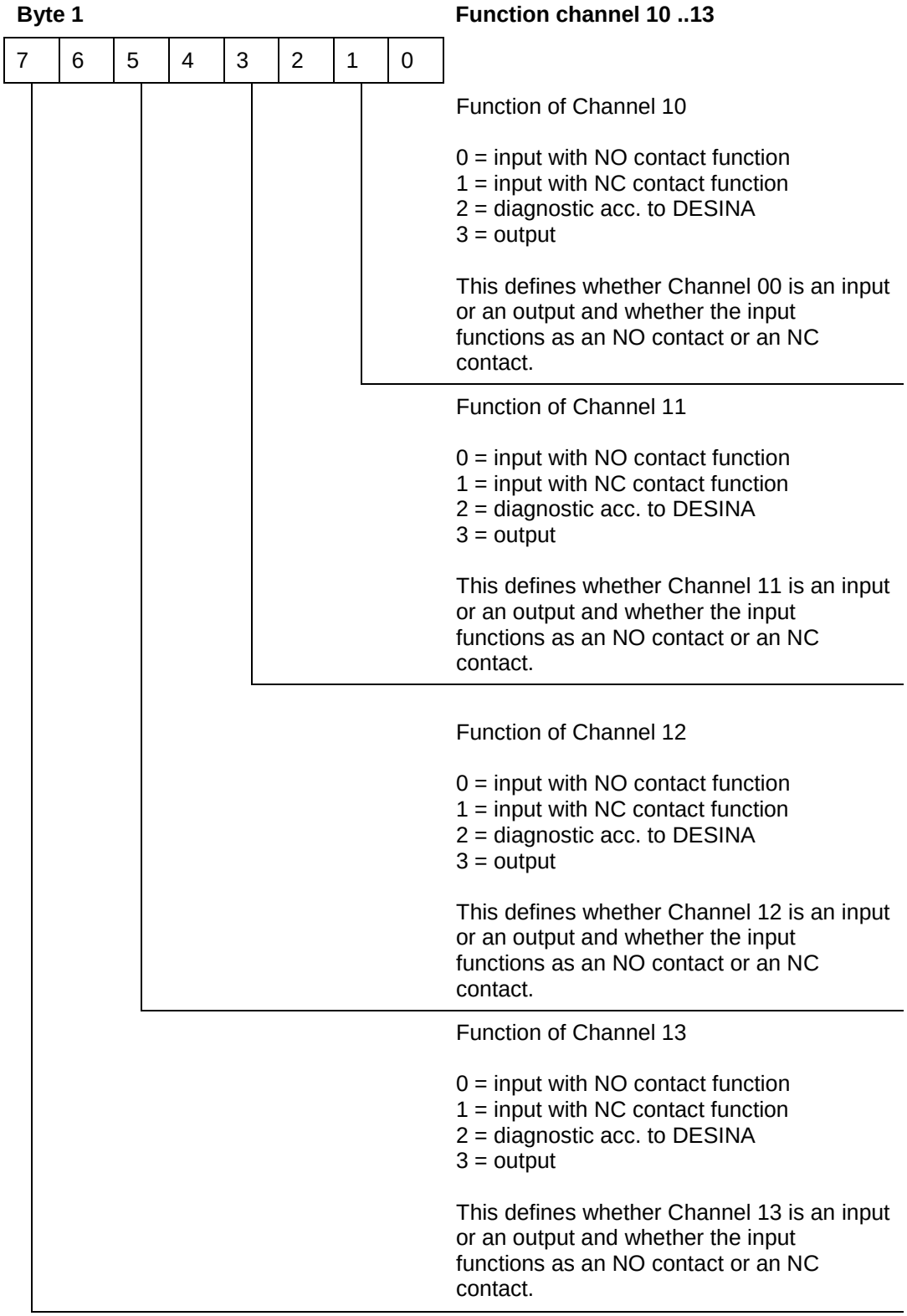

Byte 1
Function channel 10 ..13
7
6
5
4
3
2
1
0
Function of Channel 10
0 = input with NO contact function
1 = input with NC contact function
2 = diagnostic acc. to DESINA
3 = output
This defines whether Channel 00 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 11
0 = input with NO contact function
1 = input with NC contact function
2 = diagnostic acc. to DESINA
3 = output
This defines whether Channel 11 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 12
0 = input with NO contact function
1 = input with NC contact function
2 = diagnostic acc. to DESINA
3 = output
This defines whether Channel 12 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 13
0 = input with NO contact function
1 = input with NC contact function
2 = diagnostic acc. to DESINA
3 = output
This defines whether Channel 13 is an input or an output and whether the input functions as an NO contact or an NC contact.

Fig. 48 Parameter byte 1 Art. No. 56752

Bit assignment of parameter Byte 2

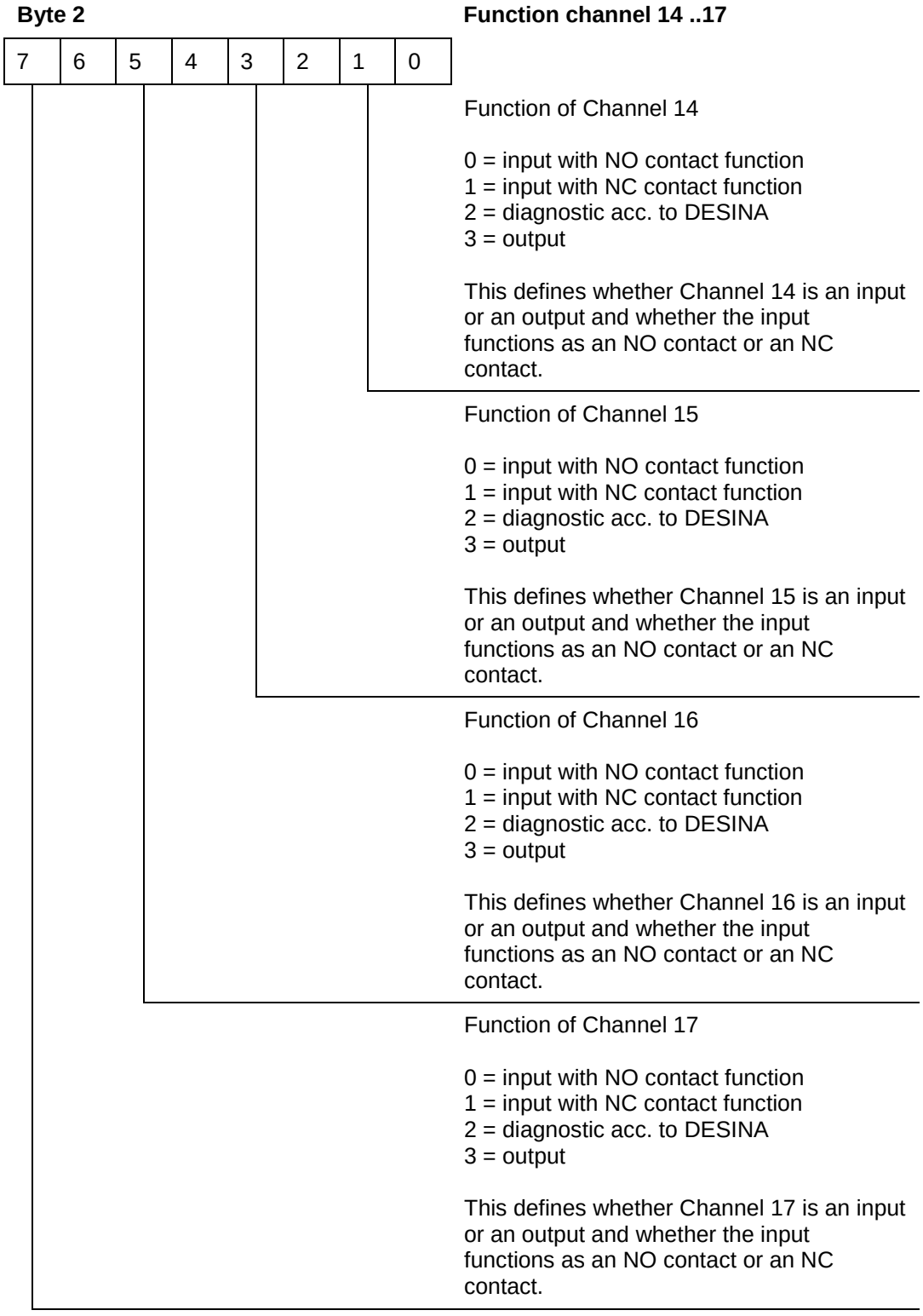

Byte 2
Function channel 14 ..17
7
6
5
4
3
2
1
0
Function of Channel 14
0 = input with NO contact function
1 = input with NC contact function
2 = diagnostic acc. to DESINA
3 = output
This defines whether Channel 14 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 15
0 = input with NO contact function
1 = input with NC contact function
2 = diagnostic acc. to DESINA
3 = output
This defines whether Channel 15 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 16
0 = input with NO contact function
1 = input with NC contact function
2 = diagnostic acc. to DESINA
3 = output
This defines whether Channel 16 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 17
0 = input with NO contact function
1 = input with NC contact function
2 = diagnostic acc. to DESINA
3 = output
This defines whether Channel 17 is an input or an output and whether the input functions as an NO contact or an NC contact.

Fig. 49 Parameter byte 2 Art. No. 56752

Bit assignment of parameter bytes 3..5

0 (reserved)

Bit assignment of parameter Byte 6

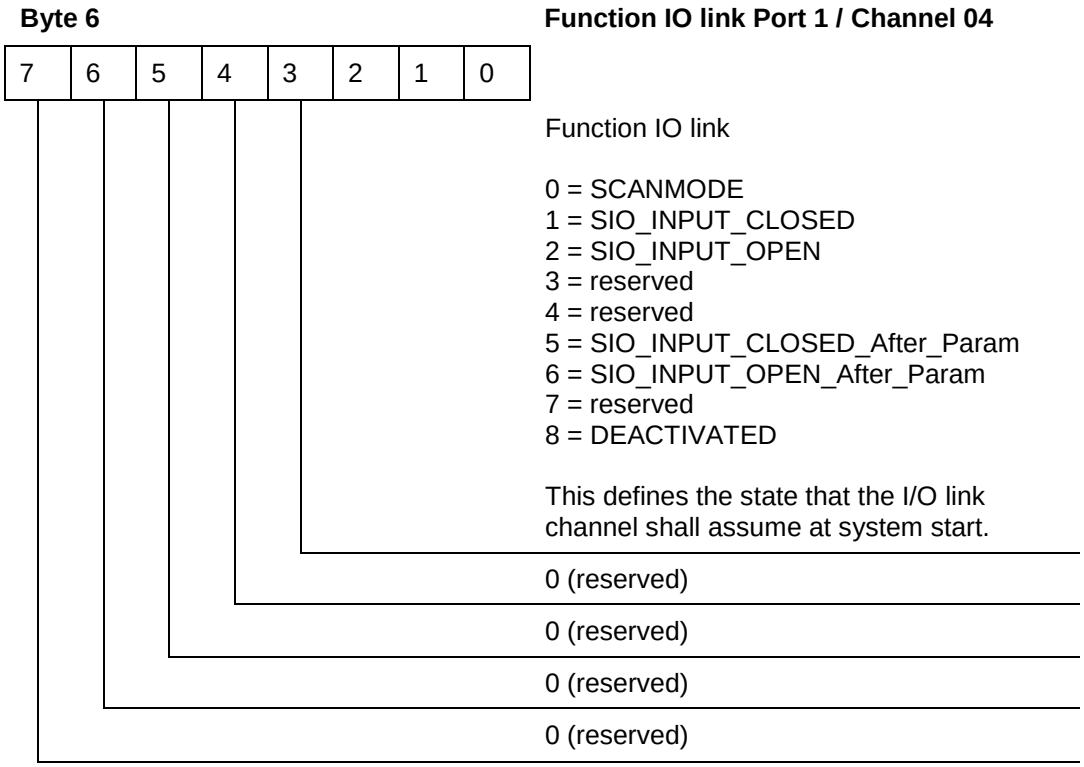


Fig. 50 Parameter byte 6 Art. No. 56752

Bit assignment of parameter Byte 7

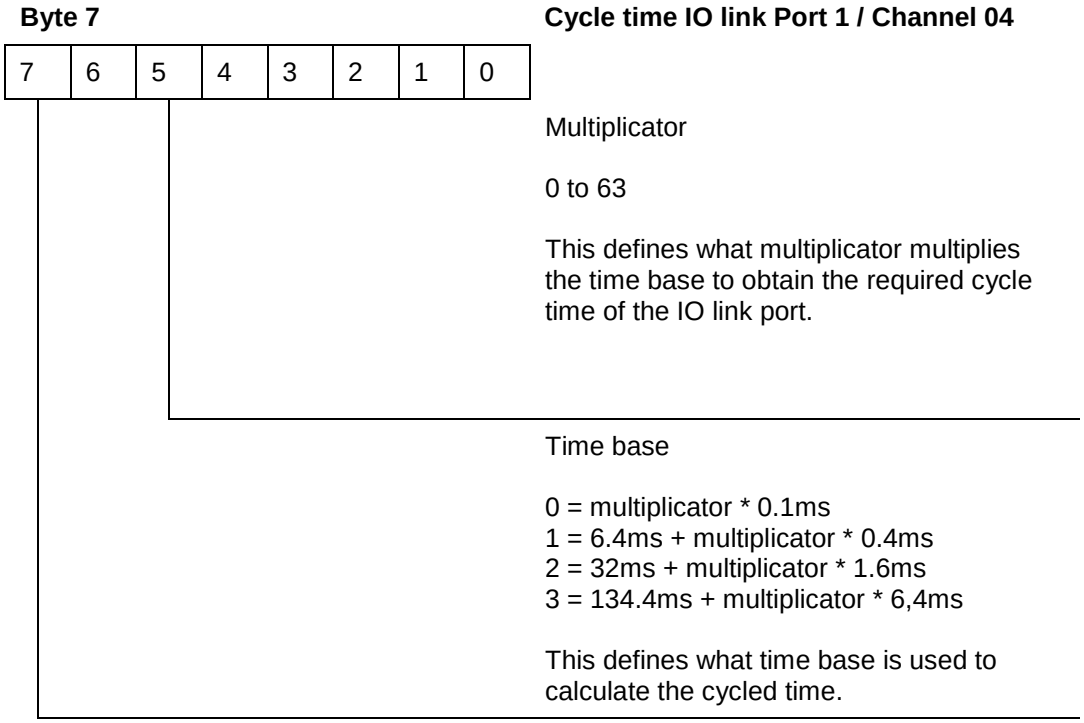

Byte 7
Cycle time IO link Port 1 / Channel 04
7 6 5 4 3 2 1 0
Multiplicator
0 to 63
This defines what multiplicator multiplies the time base to obtain the required cycle time of the IO link port.
Time base
0 = multiplicator * 0.1ms
1 = 6.4ms + multiplicator * 0.4ms
2 = 32ms + multiplicator * 1.6ms
3 = 134.4ms + multiplicator * 6,4ms
This defines what time base is used to calculate the cycled time.

Fig. 51 Parameter byte 7 Art. No. 56752

Bit assignment of parameter Byte 8

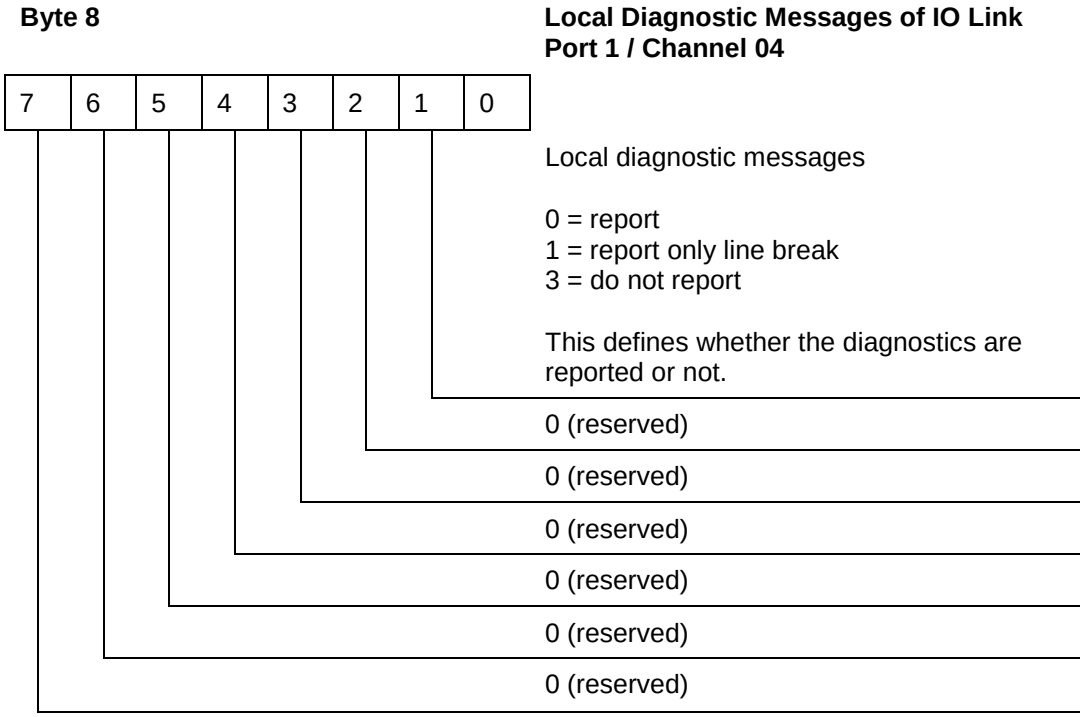

Byte 8
Local Diagnostic Messages of IO Link Port 1 / Channel 04
7 6 5 4 3 2 1 0
Local diagnostic messages
0 = report
1 = report only line break
3 = do not report
This defines whether the diagnostics are reported or not.
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)

Fig. 52 Parameter byte 8 Art. No. 56752

Bit assignment of parameter Byte 9

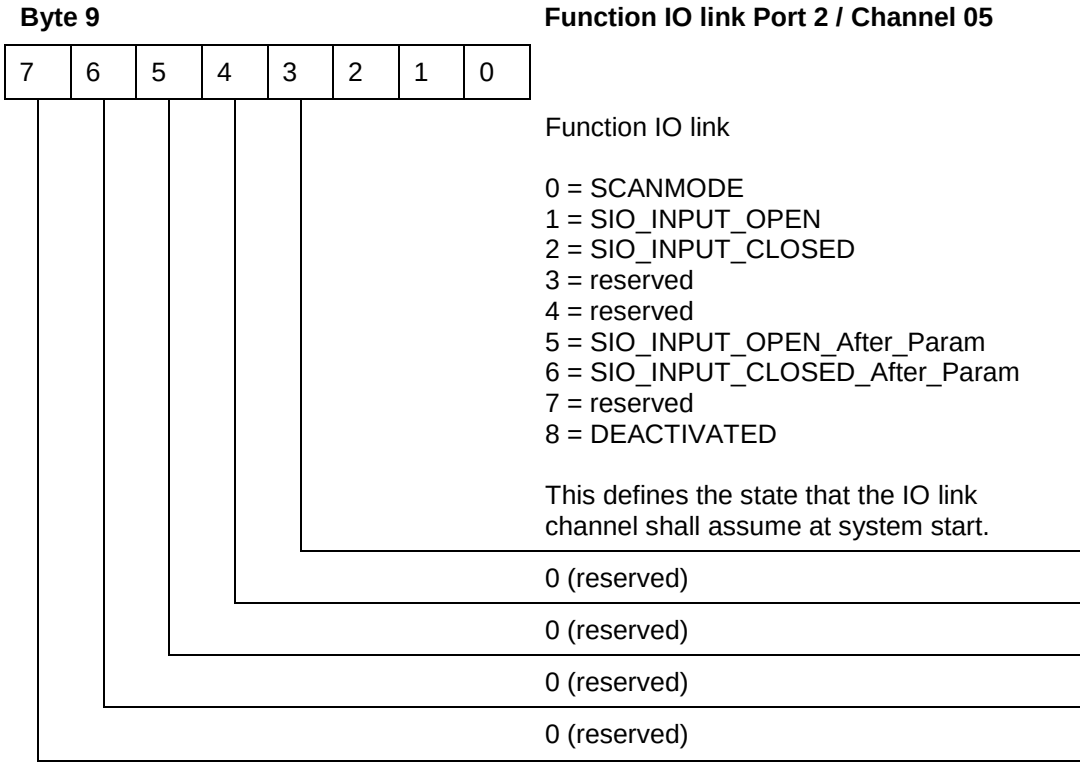


Fig. 53 Parameter byte 9 Art. No. 56752

Bit assignment of parameter Byte 10

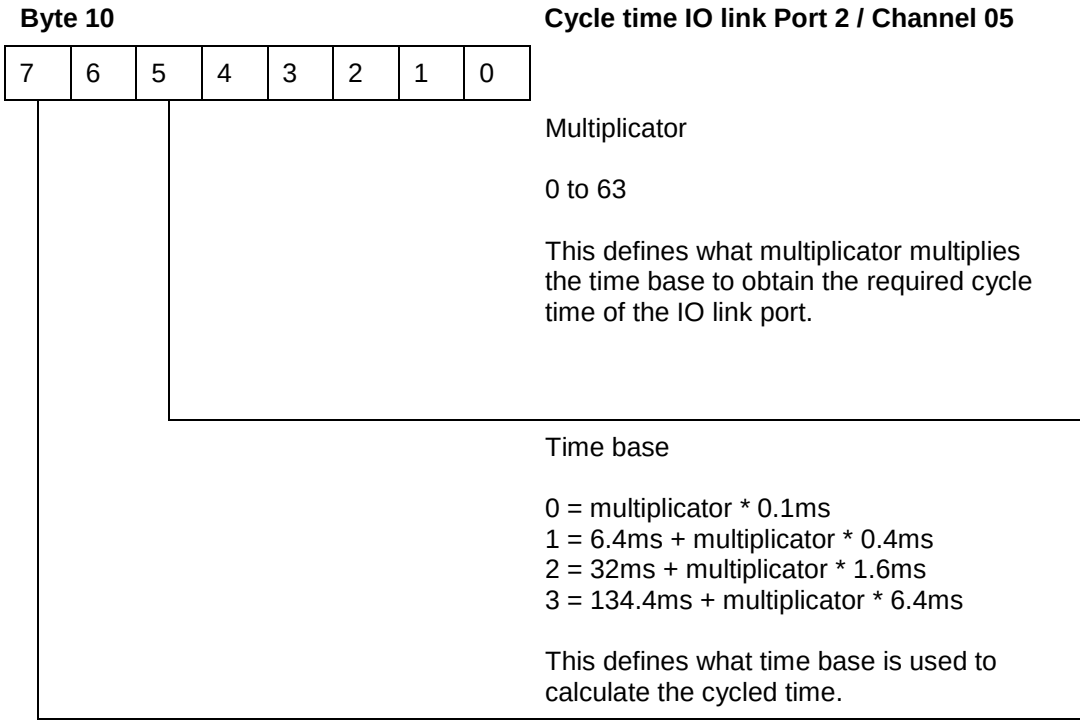

Byte 10
Cycle time IO link Port 2 / Channel 05
7 6 5 4 3 2 1 0
Multiplicator
0 to 63
This defines what multiplicator multiplies the time base to obtain the required cycle time of the IO link port.
Time base
0 = multiplicator * 0.1ms
1 = 6.4ms + multiplicator * 0.4ms
2 = 32ms + multiplicator * 1.6ms
3 = 134.4ms + multiplicator * 6.4ms
This defines what time base is used to calculate the cycled time.

Fig. 54 Parameter byte 10 Art. No. 56752

Bit assignment of parameter Byte 11

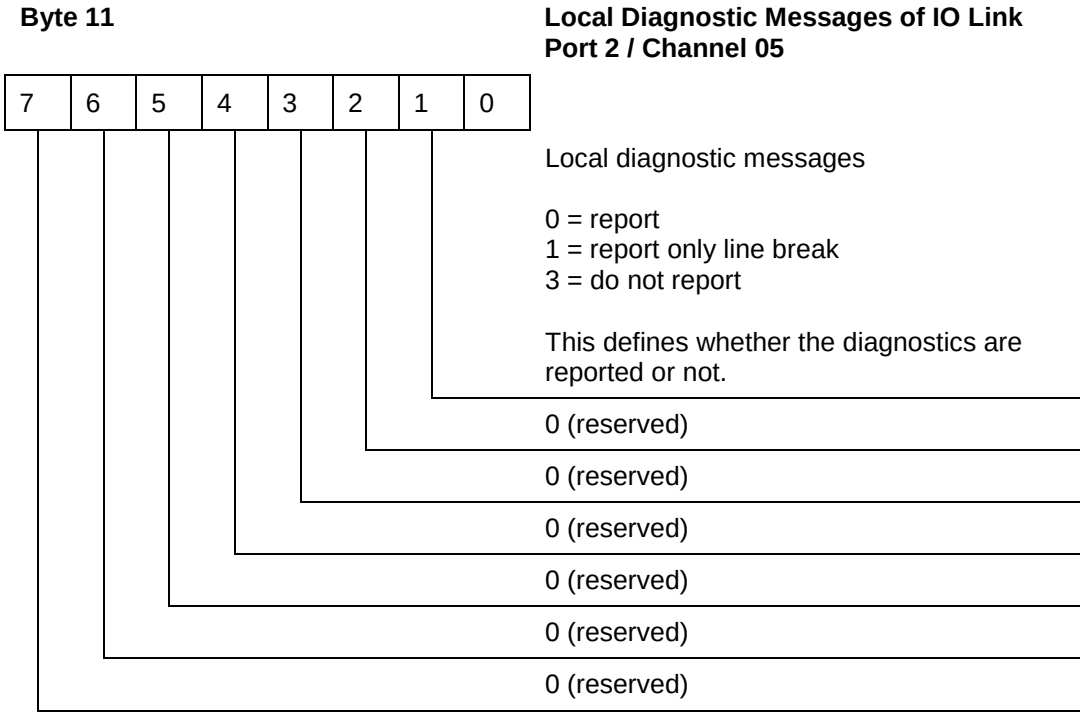

Byte 11
Local Diagnostic Messages of IO Link Port 2 / Channel 05
7 6 5 4 3 2 1 0
Local diagnostic messages
0 = report
1 = report only line break
3 = do not report
This defines whether the diagnostics are reported or not.
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)

Fig. 55 Parameter byte 11 Art. No. 56752

Bit assignment of parameter Byte 12

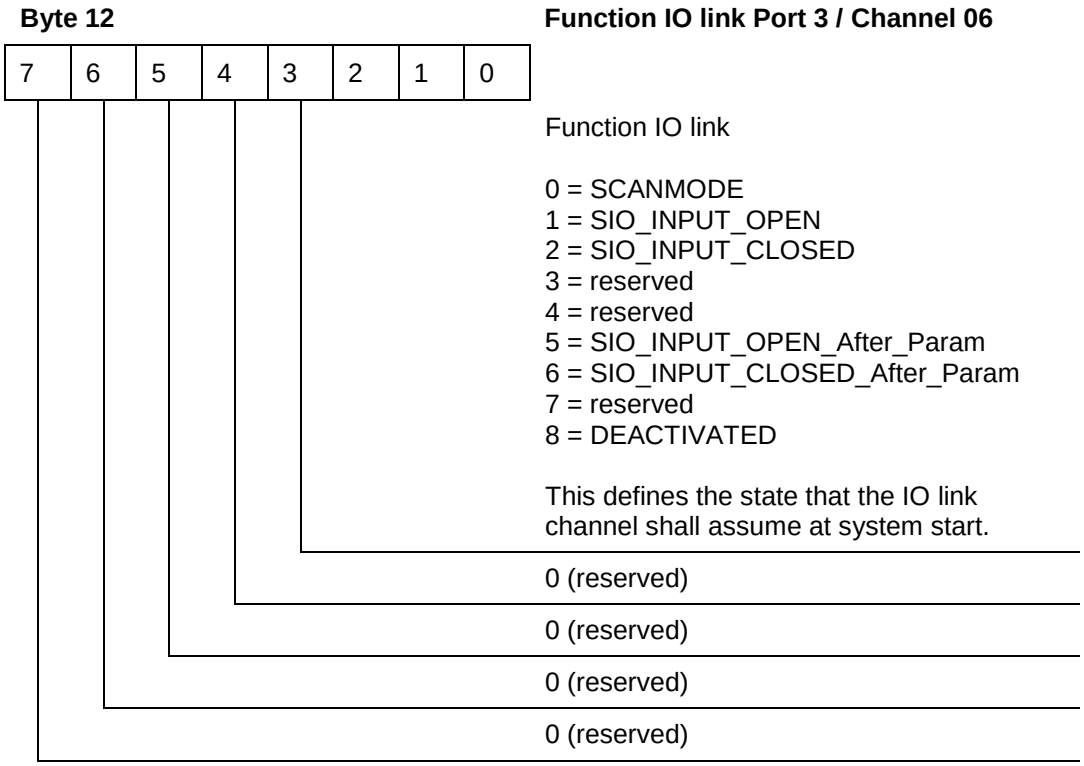


Fig. 56 Parameter byte 12 Art. No. 56752

Bit assignment of parameter Byte 13

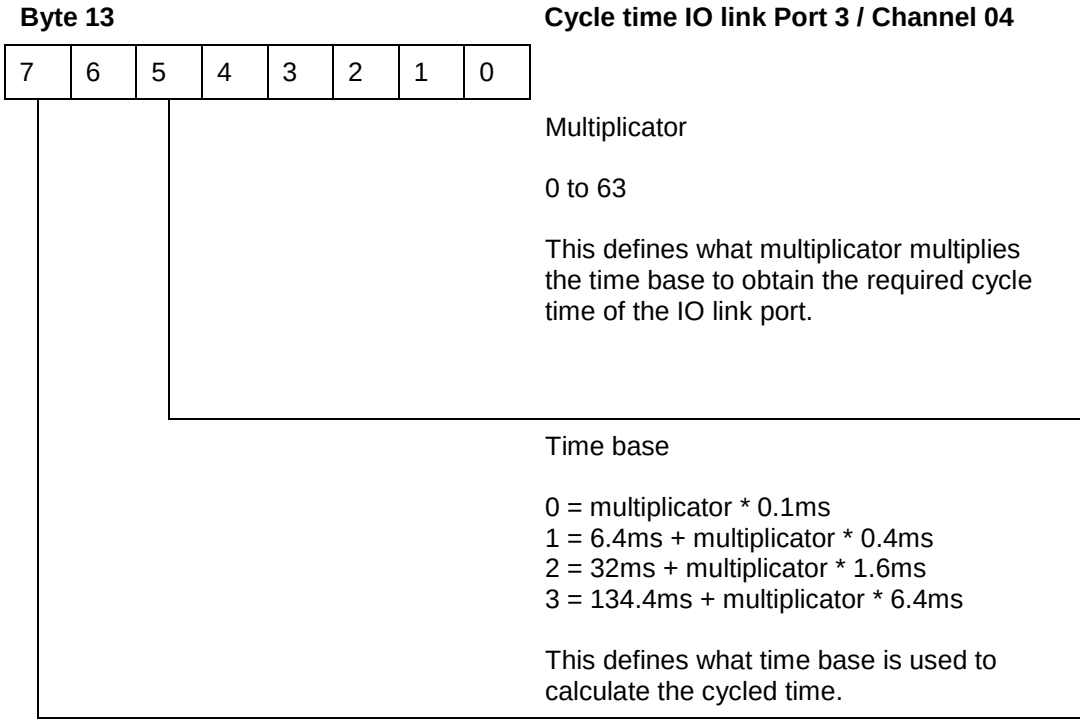

Byte 13
Cycle time IO link Port 3 / Channel 04
7 6 5 4 3 2 1 0
Multiplicator
0 to 63
This defines what multiplicator multiplies the time base to obtain the required cycle time of the IO link port.
Time base
0 = multiplicator * 0.1ms
1 = 6.4ms + multiplicator * 0.4ms
2 = 32ms + multiplicator * 1.6ms
3 = 134.4ms + multiplicator * 6.4ms
This defines what time base is used to calculate the cycled time.

Fig. 57 Parameter byte 13 Art. No. 56752

Bit assignment of parameter Byte 14

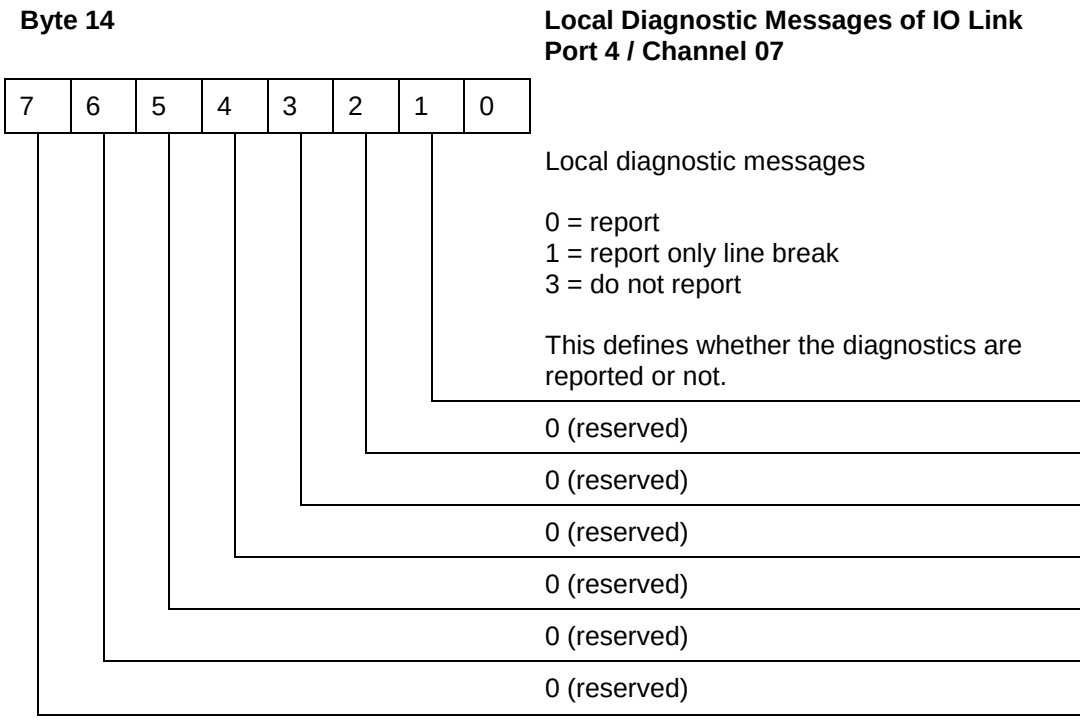

Byte 14
Local Diagnostic Messages of IO Link Port 4 / Channel 07
7 6 5 4 3 2 1 0
Local diagnostic messages
0 = report
1 = report only line break
3 = do not report
This defines whether the diagnostics are reported or not.
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)

Fig. 58 Parameter byte 14 Art. No. 56752

Bit assignment of parameter Byte 15

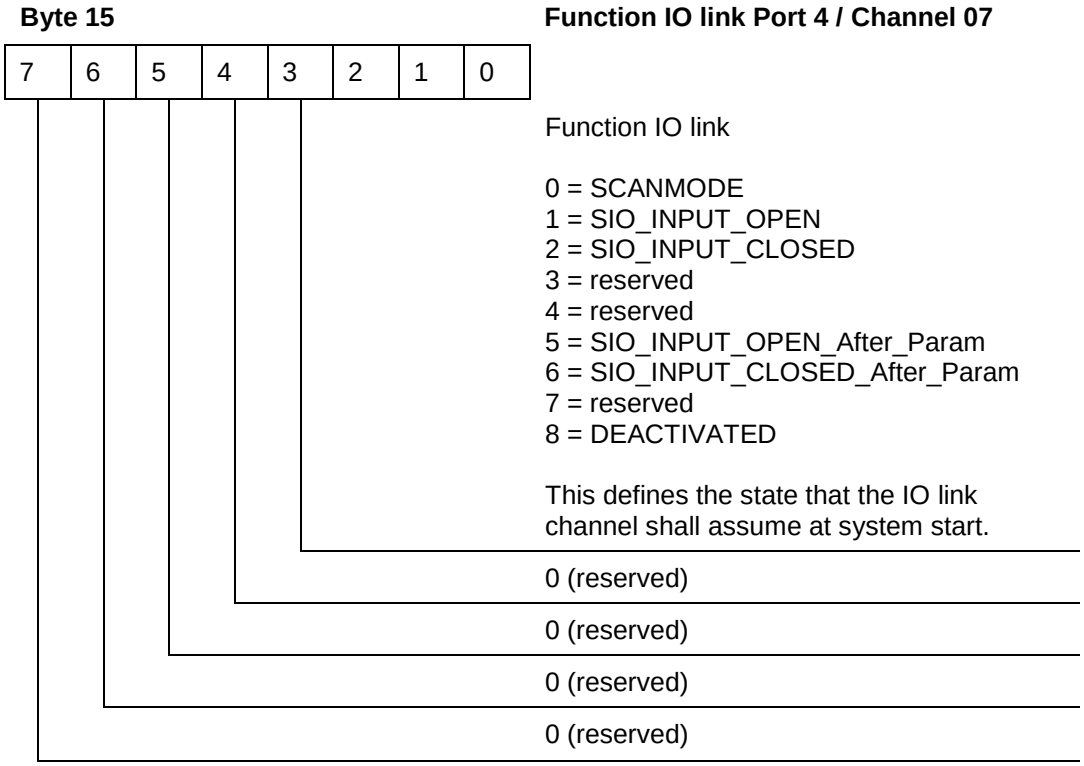


Fig. 59 Parameter byte 15 Art. No. 56752

Bit assignment of parameter Byte 16

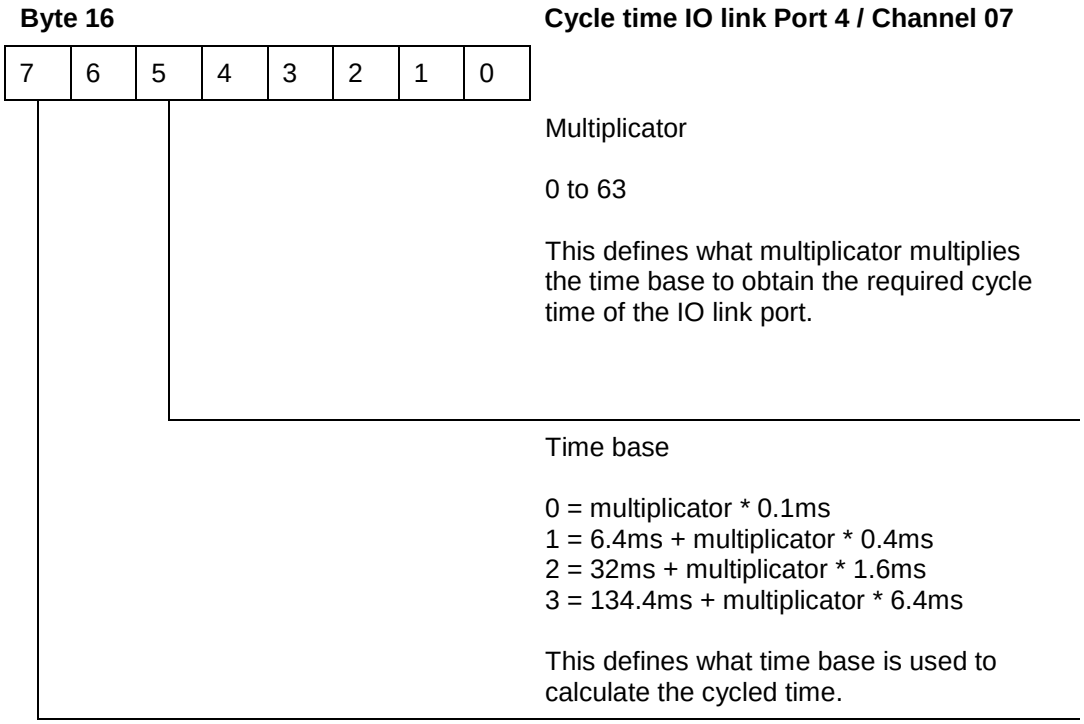

Byte 16
Cycle time IO link Port 4 / Channel 07
7 6 5 4 3 2 1 0
Multiplicator
0 to 63
This defines what multiplicator multiplies the time base to obtain the required cycle time of the IO link port.
Time base
0 = multiplicator * 0.1ms
1 = 6.4ms + multiplicator * 0.4ms
2 = 32ms + multiplicator * 1.6ms
3 = 134.4ms + multiplicator * 6.4ms
This defines what time base is used to calculate the cycled time.

Fig. 60 Parameter byte 16 Art. No. 56752

Bit assignment of parameter Byte 17

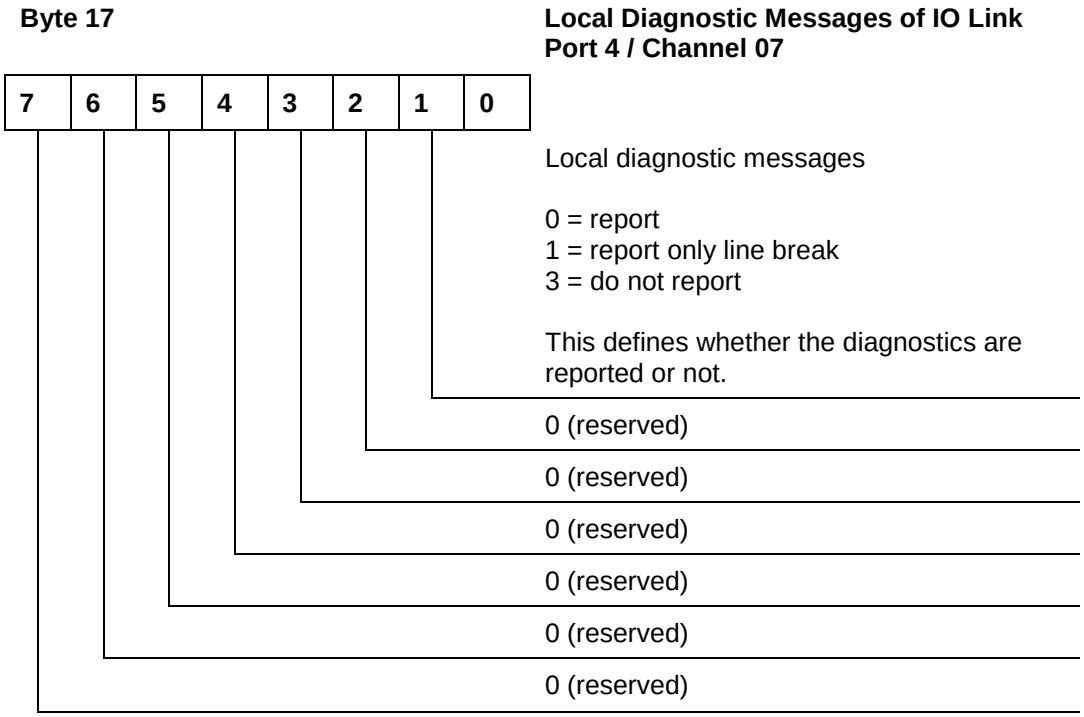

Byte 17
Local Diagnostic Messages of IO Link Port 4 / Channel 07
7 6 5 4 3 2 1 0
Local diagnostic messages
0 = report
1 = report only line break
3 = do not report
This defines whether the diagnostics are reported or not.
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)

Fig. 61 Parameter byte 17 Art. No. 56752

8.1.4 Data Cube67+ DIO12 IOL4 E 8xM12

Bit assignment I/O data - input data PAE

Byte 0								
Bit	7	6	5	4	3	2	1	0
Pin 4 Socket	7	6	5	4	3	2	1	0

Tab. 19 PAE data byte 1 Art. No. 56752

Byte 1								
Bit	7	6	5	4	3	2	1	0
Pin 2 Socket	7	6	5	4	3	2	1	0

Tab. 20 PAE data byte 2 Art. No. 56752

Bit assignment I/O data - output data PAA

Byte 0								
Bit	7	6	5	4	3	2	1	0
Pin 4 Socket	7	6	5	4	3	2	1	0

Tab. 21 PAE data byte 1 Art. No. 56752

Byte 1								
Bit	7	6	5	4	3	2	1	0
Pin 2 Socket	7	6	5	4	3	2	1	0

Tab. 22 PAE data byte 2 Art. No. 56752

In addition to the 2 bytes for PAE and PAA each, the configured IO Link PAE and PAA bytes are transmitted. The data length depends on the virtual modules used.

8.1.5 I&M Functions of Cube67+ DIO12 IOL4 E 8xM12

For communication with the IO link sensors, the Cube67+ DIO12 IOL4 E 8xM12 also supports I&M functions. They are used for communication with the IO link devices as well as to represent module-specific information.

Index 65000 read = IM0 of Cube67+ DIO12 IOL4 E 8xM12

Index 65016 read = IO – Link – MM acc. to specification

Index 65017 read = IM17 information from IO – Link Port 1

Index 65018 read = IM18 information from IO – Link Port 2

Index 65019 read = IM19 information from IO – Link Port 3

Index 65020 read = IM20 information from IO – Link Port 4

Index 65098 read and write = communication channel to connected IO link devices

Index 65099 read = IO – Link Master Directory

I&M queries must always be requested at the slot of the Cube67+ DIO12 IOL4 E 8xM12. For port-related IO link queries via IM98 (65098), the requested port is contained in the I/O link protocol (Ports 1 to 4)

8.2 Cube67+ DIO4 RS232/485 E 4xM12 Art. No. 56761

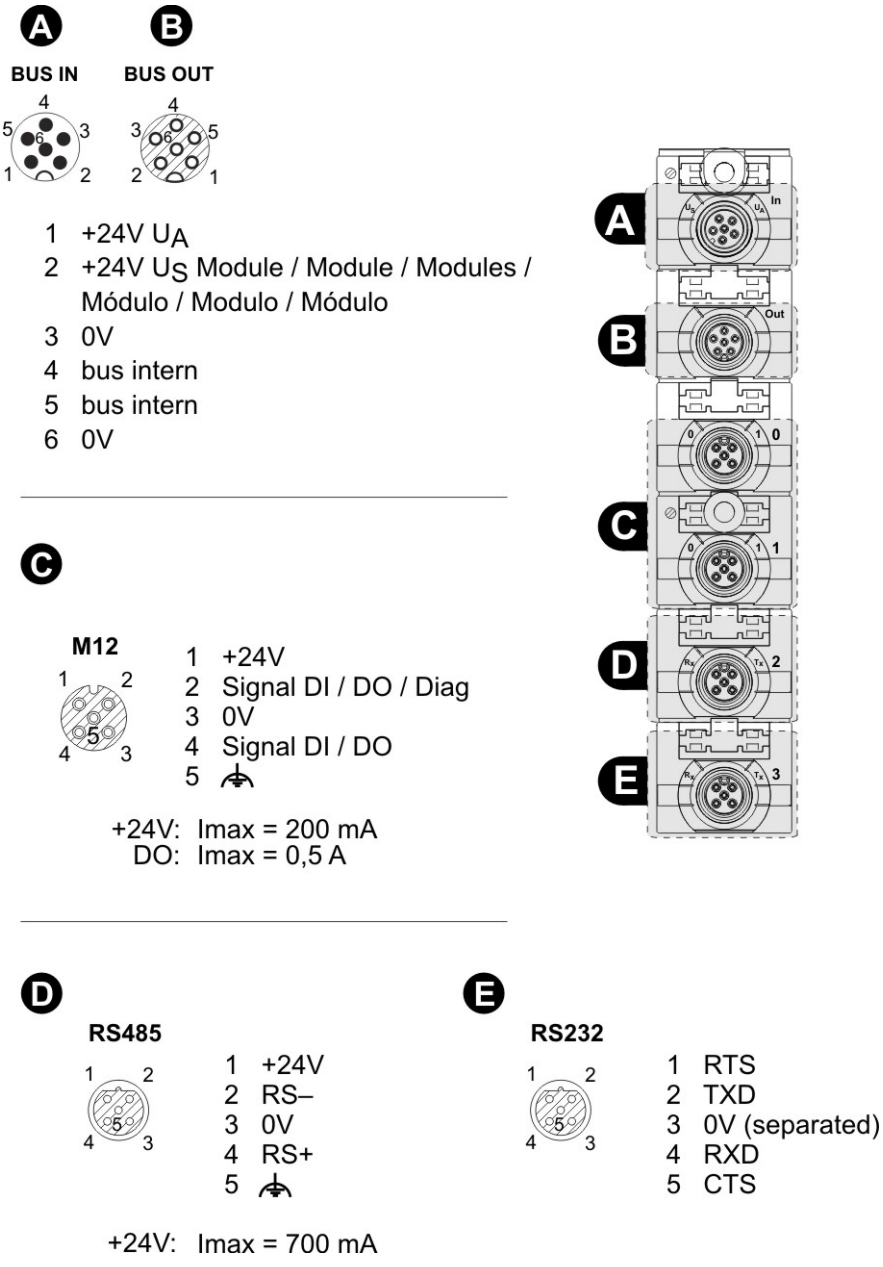


Fig. 1 Pin assignment and terminal overview

8.2.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
Cube67+ DIO4 RS232 E 4xM12	56761	2 bytes	2 bytes	$C3_{hex}$ 01_{hex} 01_{hex} DD_{hex} $B9_{hex}$ $0A_{hex}$
Cube67+ DIO4 RS485 E 4xM12	56761	2 bytes	2 bytes	$C3_{hex}$ 01_{hex} 01_{hex} DD_{hex} $B9_{hex}$ $0A_{hex}$
Cube67+ DIO4 MOVIMOT E 4xM12	56761	2 bytes	2 bytes	$C3_{hex}$ 01_{hex} 01_{hex} DD_{hex} $B9_{hex}$ $0A_{hex}$

Tab. 23 Identification Art. No. 56761

The total identification of the Cube67+ DIO4 RS232/485 E 4xM12 module is composed of the above mentioned identification and the identifications of two following virtual modules. Please refer to the associated GSD file for the identifications of the virtual modules.

Three separate modules are provided for the configuration, whereby one of the RS232 or RS485 communication interfaces in each case is active; The other is inactive. The Cube67+ DIO4 MOVIMOT E 4xM12 module operates over the RS485 communication interface and is designed to operate a specific gear motor made by SEW-Eurodrive GmbH & Co. KG.

To configure a module of type Art. No. 56761 correctly, one of the base modules must be configured first. A virtual receiver module must first be configured in the subsequent slots followed by a virtual transmitter module. Receiver modules are given the designation "_RX_" and transmitter modules the designation "_TX_“. The configuration procedure is described in Section 3.7. Below are examples of each of the three basic configurations.

Steckplatz	DP-Kennu...	Bestellnummer / Bezeichnung	E-Adresse	A-Adresse	Kommentar
1	3	56521 BN-P			
2	1	Strang 0			
3	1	Strang 1			
4	195	56761 DIO4 RS232 E 4xM12	500...501	500...501	
5	66	RS_RX_48 Byte	0...47		
6	130	RS_TX_48 Byte		0...47	
7	1	Strang 2			
8	1	Strang 3			
9					
10					

Fig. 2 Example configuration of Art. No. 56761 Cube67+ DIO4 RS232 E 4xM12

Steckplatz	DP-Kennung	Bestellnummer / Bezeichnung	E...	A...	Kommentar
1	3	56521 BN-P			
2	1	Strang 0			
3	1	Strang 1			
4	1	Strang 2			
5	195	56761 DIO4 RS485 E 4xM12	0...1	0...1	
6	66	RS_RX_128 Byte	272...		
7	130	RS_TX_16 Byte		100...	
8	1	Strang 3			

Fig. 3 Example configuration of Art. No. 56761 Cube67+ DIO4 RS485 E 4xM12

Steckplatz	DP-Kennung	Bestellnummer / Bezeichnung	E...	A...	Kommentar
1	3	56521 BN-P			
2	1	Strang 0			
3	1	Strang 1			
4	1	Strang 2			
5	195	56761 DIO4 MOVIMOT E 4xM12	0...1	0...1	
6	66	MOVIMOT_RX_2 Word	272...		
7	130	MOVIMOT_TX_3 Word		272...	
8	1	Strang 3			

Fig. 4 Example configuration of Art. No. 56761 Cube67+ DIO4 MOVIMOT E 4xM12

8.2.2 SEW-MOVILINK Useful Data Protocol

The base module "Cube67+ DIO4 MOVIMOT E 4xM12" supports the SEW-MOVILINK protocol from SEW-Eurodrive GmbH & Co. KG. The following protocol data are supported:

- MOVIMOT address fixed 1
- PA useful data type 3 (2 words cyclic) for virtual module MOVIMOT_TX_2 Word
- PA useful data type 5 (3 words cyclic) for virtual module MOVIMOT_TX_3 Word
- PE useful data 2 words (status word 1, current) for virtual module MOVIMOT_RX_2 Word
- PE useful data 3 words (status word 1, current, and status word 2) for virtual module MOVIMOT_RX_3 Word
- Automatic generation of block check character (BCC) in PA useful data
- Automatic evaluation of block check character (BCC) in response telegram
- Automatic timeout watchdog

8.2.3 Parameters

Number of parameter bytes: 9

Bit assignment of the parameter byte: 0

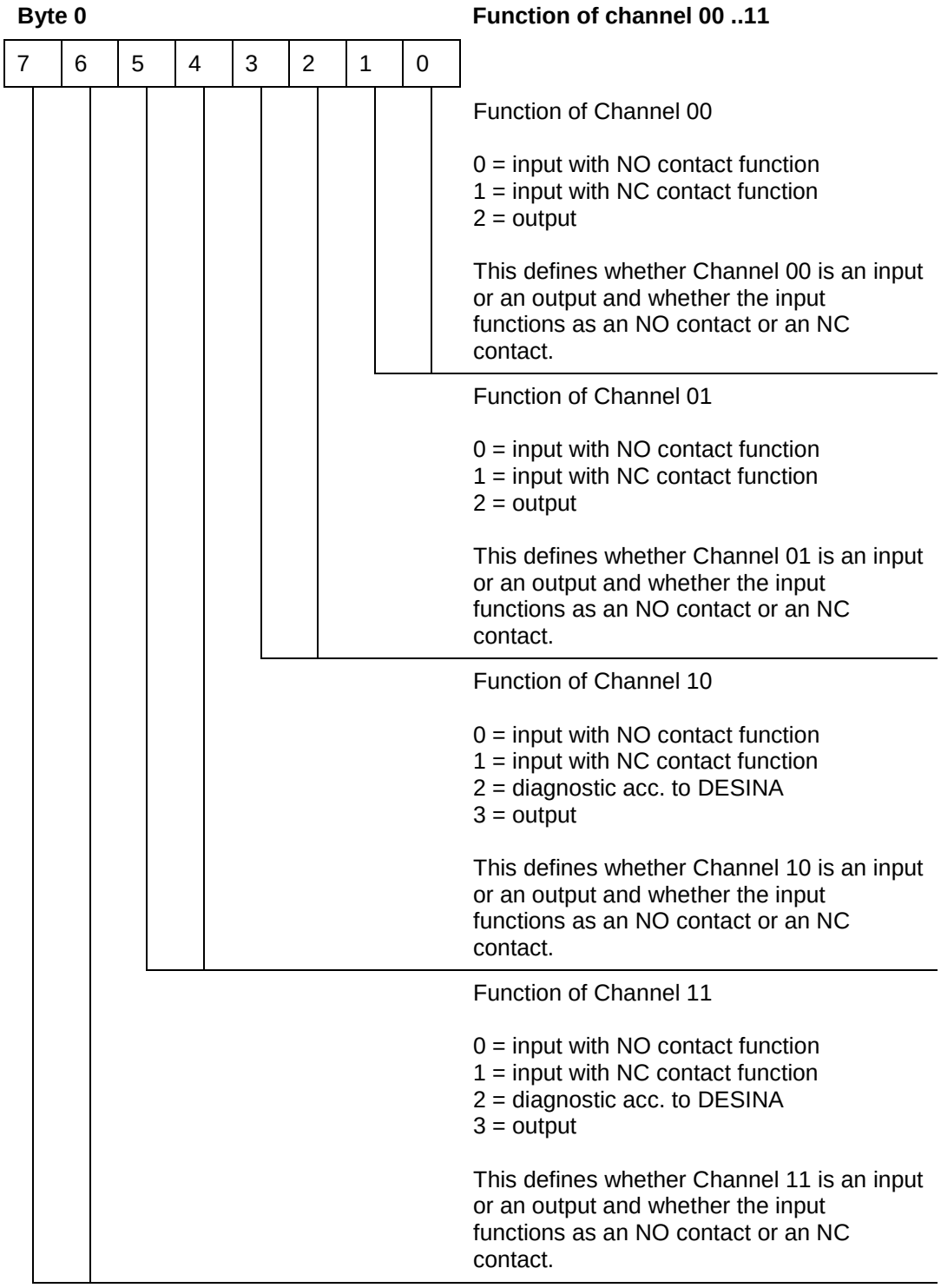

Byte 0
Function of channel 00 ..11
7 6 5 4 3 2 1 0
Function of Channel 00
0 = input with NO contact function
1 = input with NC contact function
2 = output
This defines whether Channel 00 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 01
0 = input with NO contact function
1 = input with NC contact function
2 = output
This defines whether Channel 01 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 10
0 = input with NO contact function
1 = input with NC contact function
2 = diagnostic acc. to DESINA
3 = output
This defines whether Channel 10 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 11
0 = input with NO contact function
1 = input with NC contact function
2 = diagnostic acc. to DESINA
3 = output
This defines whether Channel 11 is an input or an output and whether the input functions as an NO contact or an NC contact.

Fig. 5 Parameter byte 0 Art. No. 56761

Bit assignment of parameter Byte 1

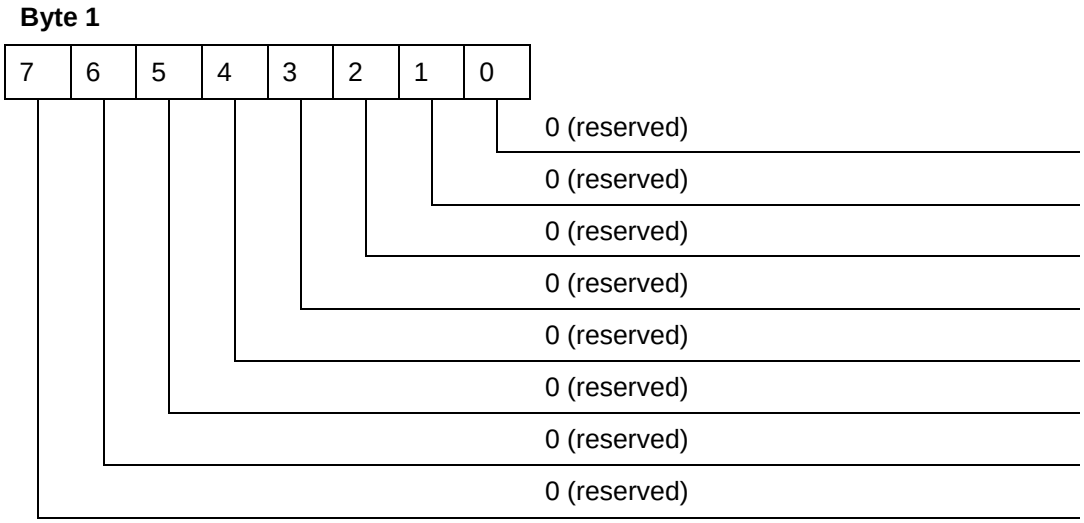


Fig. 6 Parameter byte 6 Art. No. 56761

Bit assignment of parameter Byte 2

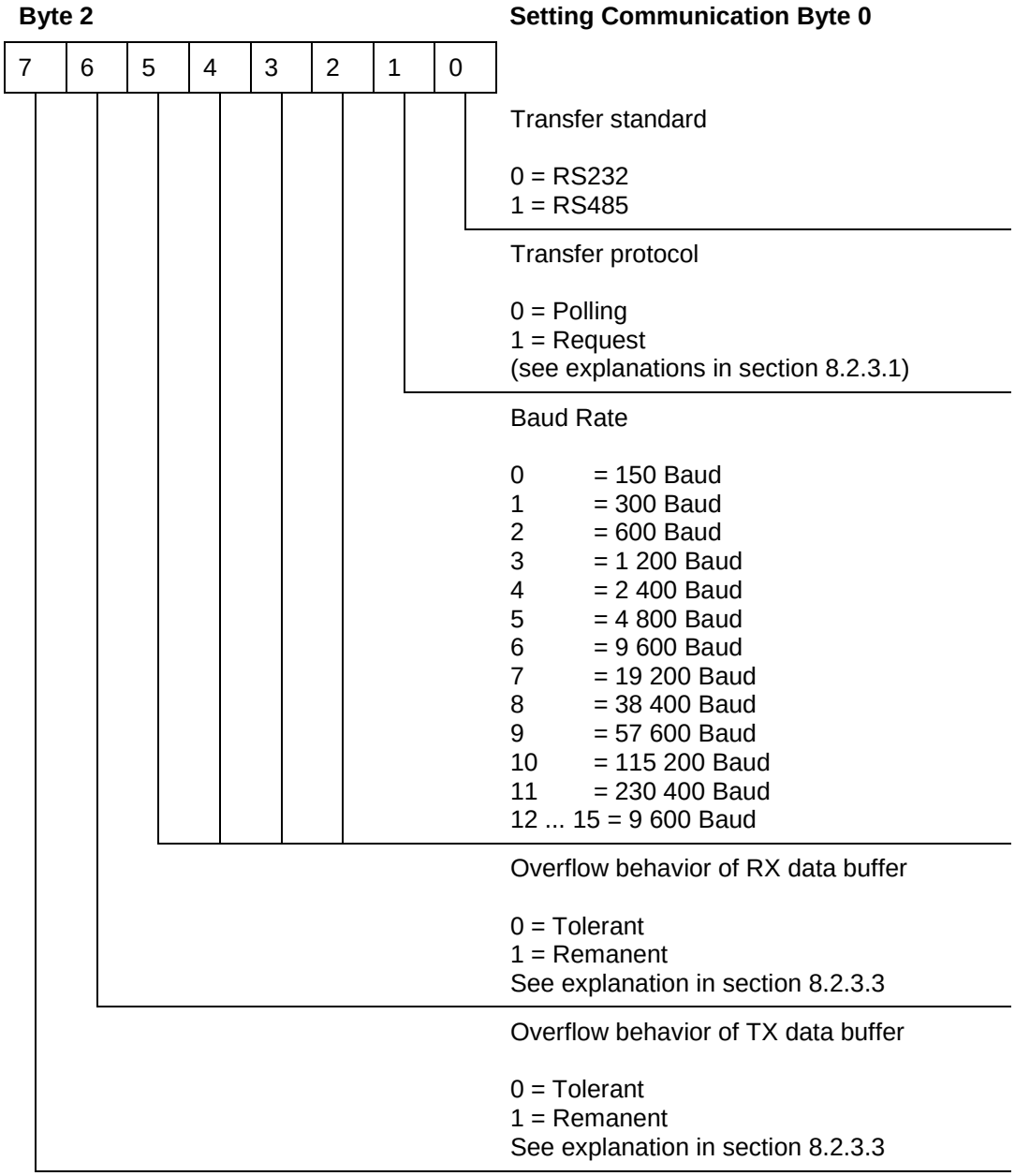


Fig. 7 Parameter byte 2 Art. No. 56761

Bit assignment of parameter Byte 3

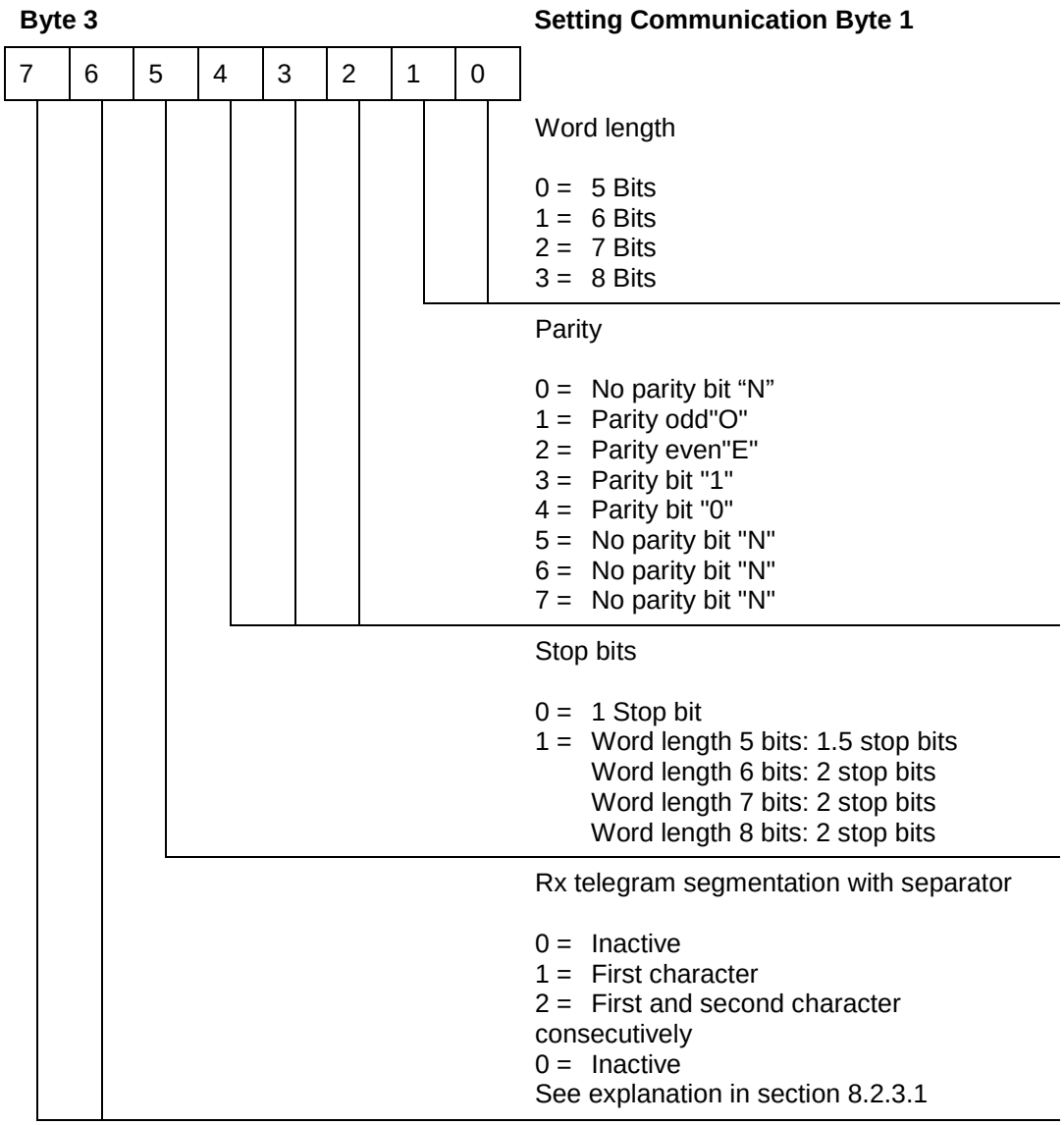


Fig. 8 Parameter byte 3 Art. No. 56761

Bit assignment of parameter Byte 4

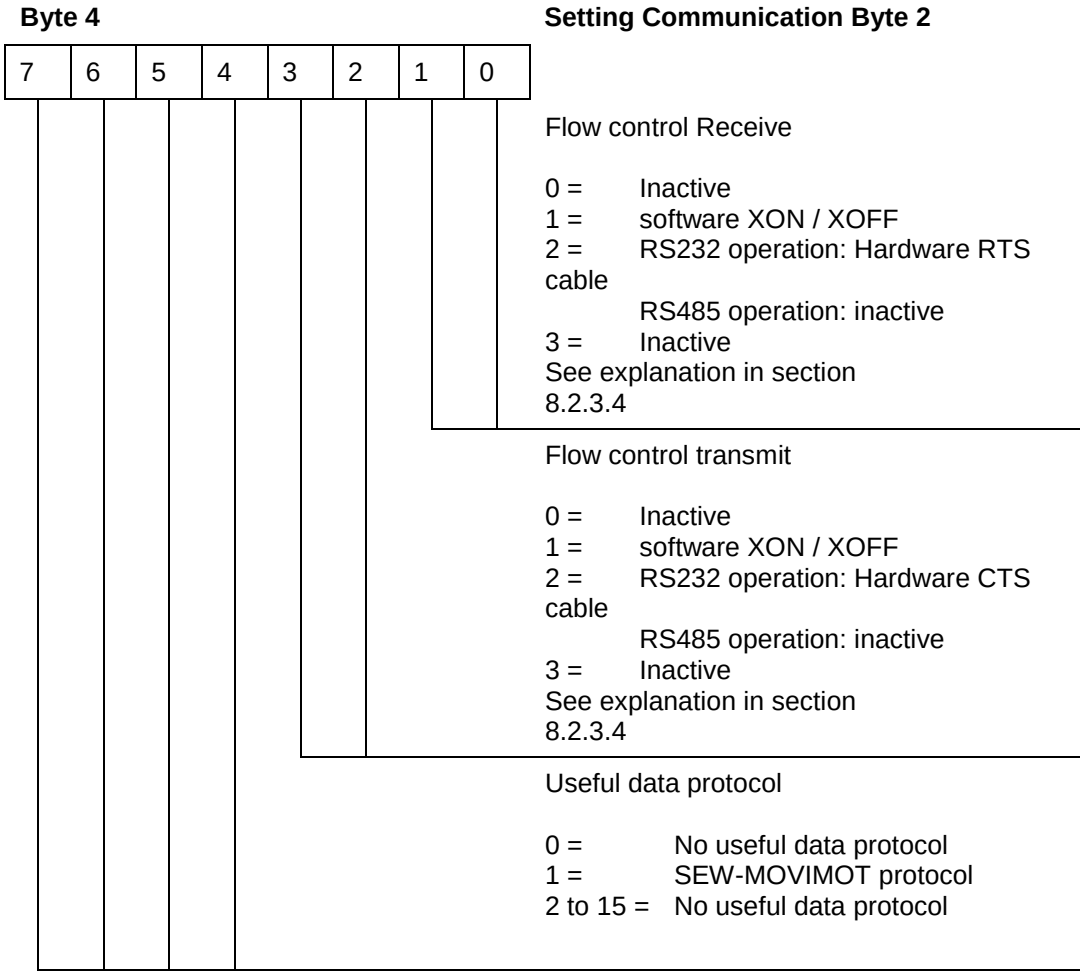


Fig. 9 Parameter byte 4 Art. No. 56761

Bit assignment of parameter Byte 5

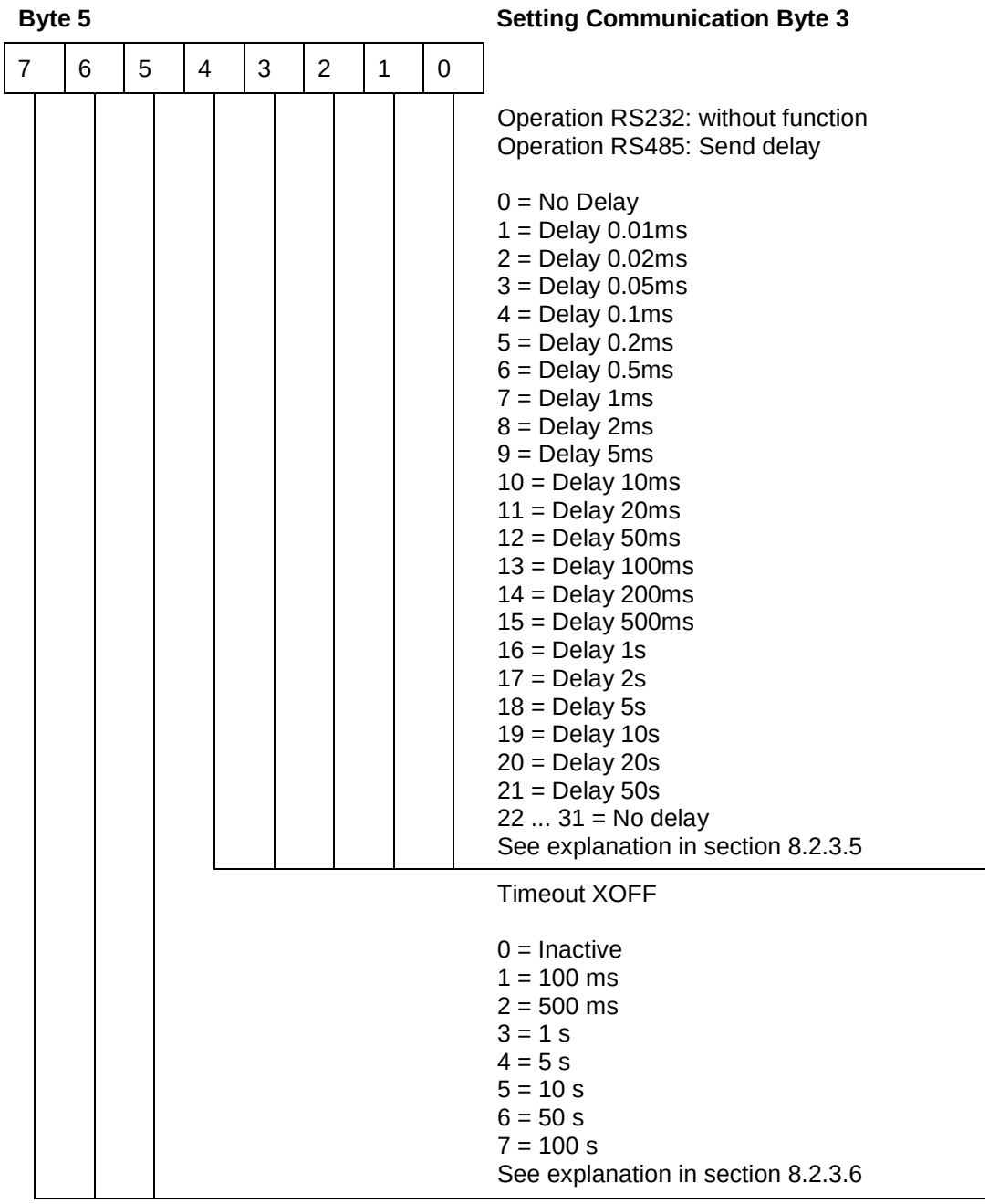


Fig. 10 Parameter byte 5 Art. No. 56761

Bit assignment of parameter Byte 6

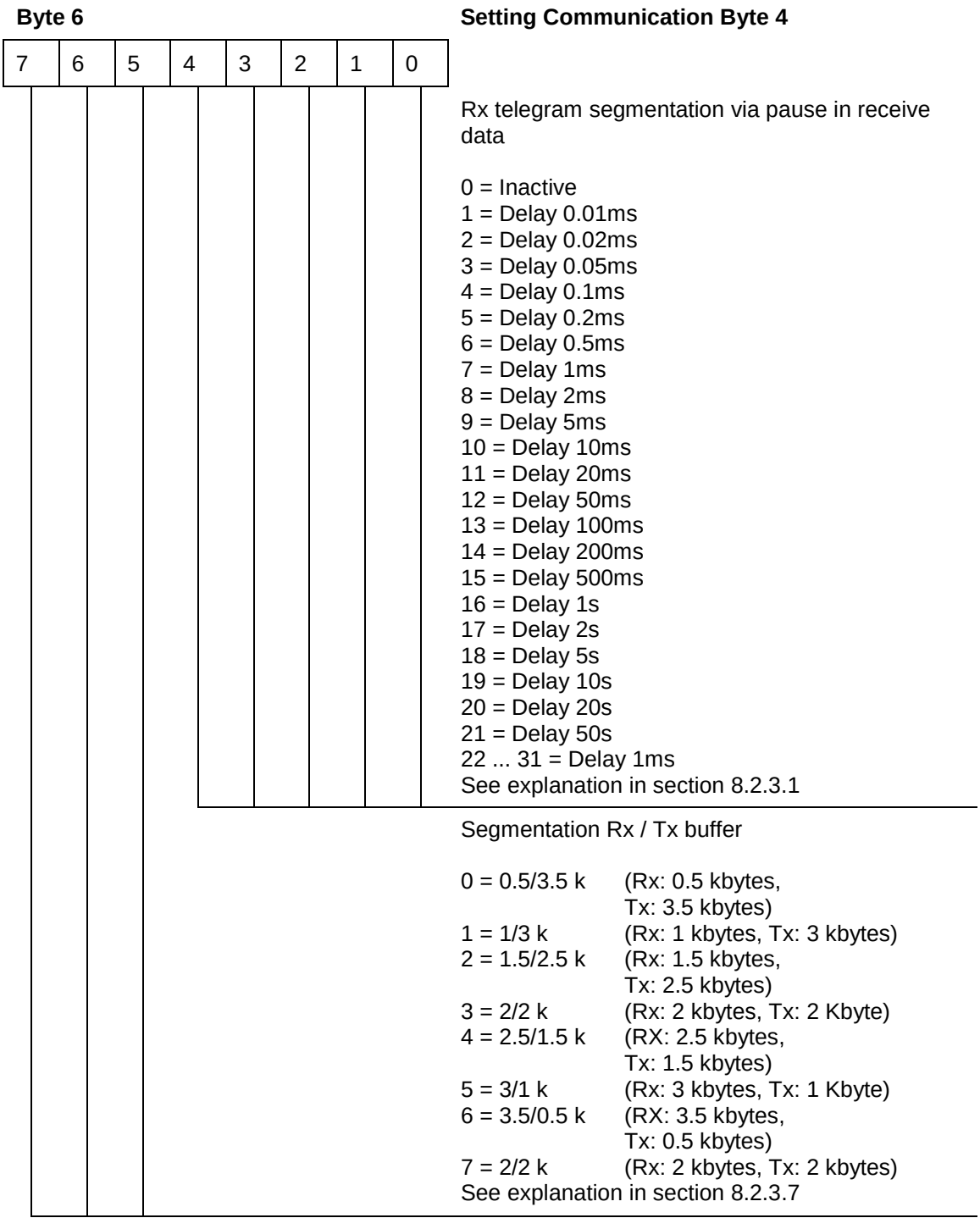

Byte 6
Setting Communication Byte 4
7 6 5 4 3 2 1 0
Rx telegram segmentation via pause in receive data
0 = Inactive
1 = Delay 0.01ms
2 = Delay 0.02ms
3 = Delay 0.05ms
4 = Delay 0.1ms
5 = Delay 0.2ms
6 = Delay 0.5ms
7 = Delay 1ms
8 = Delay 2ms
9 = Delay 5ms
10 = Delay 10ms
11 = Delay 20ms
12 = Delay 50ms
13 = Delay 100ms
14 = Delay 200ms
15 = Delay 500ms
16 = Delay 1s
17 = Delay 2s
18 = Delay 5s
19 = Delay 10s
20 = Delay 20s
21 = Delay 50s
22 ... 31 = Delay 1ms
See explanation in section 8.2.3.1
Segmentation Rx / Tx buffer
0 = 0.5/3.5 k (Rx: 0.5 kbytes, Tx: 3.5 kbytes)
1 = 1/3 k (Rx: 1 kbytes, Tx: 3 kbytes)
2 = 1.5/2.5 k (Rx: 1.5 kbytes, Tx: 2.5 kbytes)
3 = 2/2 k (Rx: 2 kbytes, Tx: 2 Kbyte)
4 = 2.5/1.5 k (RX: 2.5 kbytes, Tx: 1.5 kbytes)
5 = 3/1 k (Rx: 3 kbytes, Tx: 1 Kbyte)
6 = 3.5/0.5 k (RX: 3.5 kbytes, Tx: 0.5 kbytes)
7 = 2/2 k (Rx: 2 kbytes, Tx: 2 kbytes)
See explanation in section 8.2.3.7

Fig. 11 Parameter byte 6 Art. No. 56761

Bit assignment of parameter Byte 7

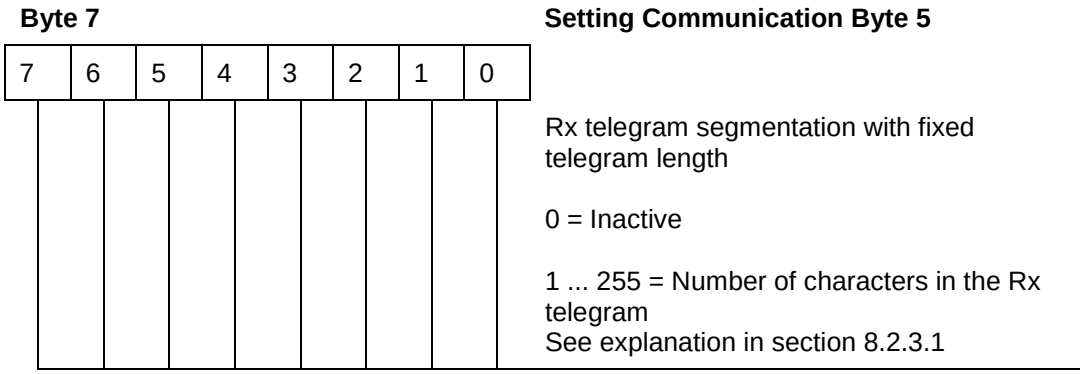

Byte 7
Setting Communication Byte 5
7 6 5 4 3 2 1 0
Rx telegram segmentation with fixed telegram length
0 = Inactive
1 ... 255 = Number of characters in the Rx telegram
See explanation in section 8.2.3.1

Fig. 12 Parameter byte 7 Art. No. 56761

Bit assignment of parameter Byte 8

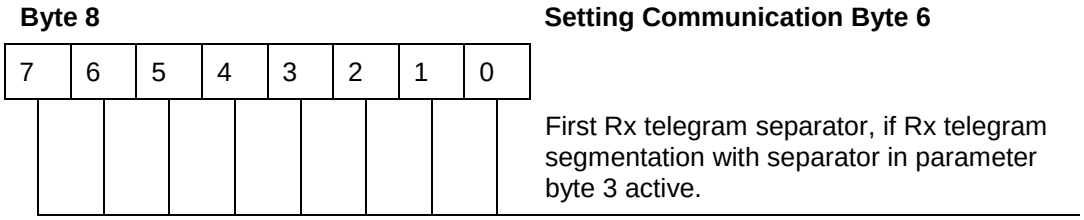

Byte 8
Setting Communication Byte 6
7 6 5 4 3 2 1 0
First Rx telegram separator, if Rx telegram segmentation with separator in parameter byte 3 active.

Fig. 13 Parameter byte 8 Art. No. 56761

Bit assignment of parameter Byte 9

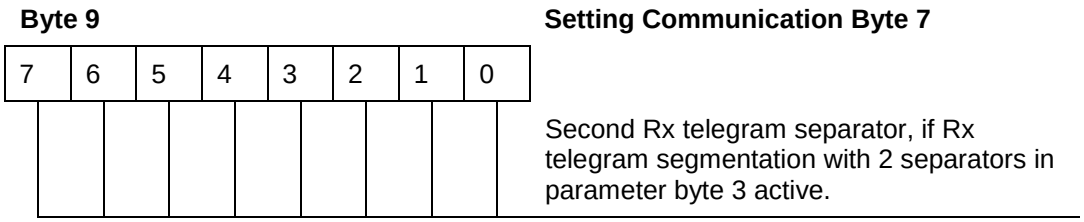

Byte 9
Setting Communication Byte 7
7 6 5 4 3 2 1 0
Second Rx telegram separator, if Rx telegram segmentation with 2 separators in parameter byte 3 active.

Fig. 14 Parameter byte 9 Art. No. 56761

8.2.3.1 Rx Telegram Segmentation

RX telegram segmentation is not used in the base module "Cube67+ DIO4 MOVIMOT E 4xM12" and it is therefore not parameterizable.

The communication interface continuously transmits characters that are displayed in the communication input data of the fieldbus. Sequences of characters received are generated in form of separate telegrams. There are different ways to segment the telegrams:

Using Separators

This mechanism is suitable for receive data that do not contain every character and that have no fixed length.

You can define one or two separators for segmenting the telegrams. Segmenting with a separator is done when the first separator is received. Segmenting with two separators is done when the first separator is received and the next character in the receive data corresponds to the second separator.

The separators are displayed in the communication input data. In the default settings, both separators are 0. If you define your own separators, make sure these characters are not included in the utility data.

Using Delay (Timeout) in the Receive Data

This method is suitable for receive data that may contain all characters and do not have a fixed length. Furthermore it is suitable as protection against errors with other segmentation methods.

If activated, a telegram is segmented when the period between two characters received is longer than the selected delay. The telegram is only set after the delay in the receive buffer over. The delay is started and finished with completely received characters. This means, the time between the end of the current and beginning of the next character is measured.

Segmentation with fixed telegram length

This method is suitable of receive data with a fixed length. We recommend segmenting with a long enough delay as failure protection.

After a fixed number of characters was received, a new telegram is generated.

Segmentation of the Communication Input Data

This mechanism is permanent and cannot be avoided.

If the telegram's data length exceeds the maximum data length that can mapped in the communication input data, a new telegram is generated.

A telegram is always segmented, if at least one of the four above mentioned conditions is given. The segmented telegram is set in the receive buffer and mapped in the communication input data in accordance with the selected transfer protocol (request or polling).

If the receive buffer contains several telegrams, they will be processed according to the FIFO method. This means, the telegram generated first will be the first to be mapped in the communication input data.

A sufficient long delay has to be configured in the receive data in addition to the delimitation with a fixed telegram length. This will ensure that there is no mismatch in the receive data, if a transmission error caused missing characters.

8.2.3.2 Transfer Protocol

In the base module "Cube67+ DIO4 MOVIMOT E 4xM12", the transmission protocol is fixed to the "polling" setting and is not parameterizable.

The received telegrams in the communication input data are displayed according to the FIFO method. Depending on the transfer protocol there are different ways to load the telegrams from the receive buffer:

Transfer Protocol Polling

When a complete telegram has been received, it is immediately taken from the receive buffer and displayed in the communication input data.

Transfer Protocol Request

The telegrams in the receive buffer are only taken upon request and then displayed in the communication input data. A request is generated by setting bit 0 in the command byte that does not equal bit 0 in the status byte.

If the receive buffer contains a complete telegram during the request, it will be taken from the receive buffer and displayed in the communication input data. The data length of byte 2 in the communication input data does not equal 0.

If the receive buffer does not contain at least one complete telegram, the communication input data from byte 2 will be set to 0, same as the data length.

8.2.3.3 Overflow Behavior of the Data Buffer

The data buffer overflow response is not relevant in the base module "Cube67+ DIO4 MOVIMOT E 4xM12" and it is therefore not parameterizable.

In certain operating modes it is possible that more characters have to be entered in a data buffer than space is available. This will cause an error entry in the status byte in the communication input data of the corresponding data buffer. You will find the assignment of status bits in section 8.2.4. The status bits remain until they are reset in the communication output data via the command byte, even when the buffer memory is reset.

If there is an overflow in the receive buffer, an incomplete telegram will not be accepted. This does not affect the complete telegrams in the receive buffer.

If there is an overflow in the send buffer, the next characters will not be sent. The characters available in the send buffer will be sent via the communication interface.

If after a buffer overflow, space is again available in the buffer memory, there are two options:

Overflow behavior "tolerant"

Characters will be again transmitted into the buffer memory.

Overflow behavior "remanent"

No characters will be transmitted to the buffer memory.

8.2.3.4 Flow Control

The data buffer overflow response is not relevant in the base module "Cube67+ DIO4 MOVIMOT E 4xM12" and it is therefore not parameterizable.

To prevent overwriting the data buffer of a module, it is possible to activate a separate flow control for the send and receive module of the communication interface. Usually the same setting can be used for the send and the receive module. Special cases, however, may require different settings for the send and receive module. The following protocols for the flow control are supported:

Software XON/XOFF

When operating RS232 and RS485, the control characters XON and XOFF can be used for the flow control. Ready-to-send and ready-to-receive status is then indicated with the control characters XON and XOFF. When the control character XOFF was received, no more characters are sent via the communication interface, even when still contained in the send buffer. Only after the control character XON was received, sending will start again.

The module send the control character XOFF, included in the send data, if the number of free characters in the receive buffer is below a determined value. As soon as the number of free characters is above this value, the control character XON is sent.

The software flow control cannot be used, when the control characters XON or XOFF are included in the utility data of the communication interface.

RTS/CTS Hardware

The module will only send data when the communication interface displays ready-to-receive status via the CTS cable.

The module displays the ready-to-receive status via the RTS cable. The state depends on the number of free characters in the receive buffer, same as the software flow control.

8.2.3.5 Send Delay RS485

With RS485 operation, transmission is half duplex. To ensure correct half duplex operation, i.e. to prevent that both modules send at the same time, a delay before sending can be set. If new data are received during this delay, the delay time will start again. Only when the delay time is over, sending is restarted.

Transmission in the base module "Cube67+ DIO4 RS232 E 4xM12" is in full-duplex mode. For this reason, RS485 transmission delay is not used and can not be parameterized.

In the base module "Cube67+ DIO4 MOVIMOT E 4xM12", RS485 transmission delay is aligned to the SEW-MOVIMOT protocol and can not be parameterized.

8.2.3.6 Timeout XOFF

No flow control is used in the base module "Cube67+ DIO4 MOVIMOT E 4xM12". For this reason, the setting for Timeout XOFF is not parameterizable.

If the software flow control for the send data is operated via the control characters XON / XOFF, a timeout for receiving the character XON can be set in the receive data of the communication interface. When the character XOFF is received via the communication interface, the time delay begins. If the characters XON were not received in the data of the communication interface during the timeout, possible send data in the receive buffer will be again sent via the communication interface.

This helps to prevent that a control character XON is "missed" in the receive data of the communication interface due to a transmission error and possible no more data are sent.

8.2.3.7 Assignment of the Data Buffer

It is not possible to parameterize the segregation of the data buffer in the base module "Cube67+ DIO4 MOVIMOT E 4xM12".

The module includes a data buffer of 4kbytes. You can segment the data buffer in several levels between send and receive data. A regular segmentation of the buffer memory is recommended, i.e. 2kbytes receive buffer and 2 kbytes send buffer. A different segmentation may be useful in order to avoid buffer overflow.

8.2.4 DIO Data of Cube67+ DIO4 RS232/485 E 4xM12

Bit assignment I/O data - DIO input data PAE

Byte 1								
Bit	7	6	5	4	3	2	1	0
Pin 4 Socket	-	-	-	-	-	-	1	0

Tab. 24 PAE data byte 1 Art. No. 56761

Byte 2								
Bit	7	6	5	4	3	2	1	0
Pin 2 Socket	-	-	-	-	-	-	1	0

Tab. 25 PAE data byte 2 Art. No. 56761

Unused bits 2 ... 7 are set to "0".

Bit Assignment I/O Data - DIO Output Data PAA

Byte 1								
Bit	7	6	5	4	3	2	1	0
Pin 4 Socket	-	-	-	-	-	-	1	0

Tab. 26 PAA data byte 1 Art. No. 56761

Byte 2								
Bit	7	6	5	4	3	2	1	0
Pin 2 Socket	-	-	-	-	-	-	1	0

Tab. 27 PAA data byte 2 Art. No. 56761

Unused bits 2 ... 7 are set to "0".

8.2.5 Communication Data of Cube67+ DIO4 RS232/485 E 4xM12

8.2.5.1 Data without Useful Data Protocol

Bit Assignment of I/O Data – Communication Input Data PAE

The length of the communication input data L is determined in bytes in the configuration by a virtual input module with prefix "RS_RX". Length L results from the number following the prefix.

Byte Assignment Communication Input Data

Byte	Name	Value	Significance
0	Status	0 to 255	Status receive data. See the table below for further explanations
1	Receive counter	0 to 255	Consecutive receive telegram number
2	Data length	0 to L-3	Number of following receive data bytes
3 to L-1	Receive data	0 to 255	Receive data from interface

Tab. 28 PAE data communication Art. No. 56761

Bit assignment status in byte 0 of the communication input data

Bit	Name	Value	Significance
0	Status receive request	0 to 1	Status Request, in connection with command byte
1	Reset	0 to 1	1: Communication interface is initialized
2	Status receive buffer	0 to 3	0: no telegram available 1: at least one telegram available 2: Fill level > 80% 3: overflow (remanent)
3			
4	Status send buffer	0 to 3	0: empty 1: at least one byte available 2: Fill level > 80% 3: overflow (remanent)
5			
6	Receive error	0 to 1	0: no error 1: Error in the receive data on the communication interface (remanent)
7	Error in the telegram	0 to 1	0: no error 1: Receive error in the telegram

Tab. 29 PAE data status byte Art. No. 56761

Byte assignment I/O data - communication output data PAA

The length of the communication output data L is set via a virtual input module with prefix "RS_TX" in the Configuration. The length L results of the figure following the prefix.

Byte Assignment Communication Output Data

Byte	Name	Value	Significance
0	Command	0 to 255	Parameterization command. See the table below for further explanations.
1	Send counter	0 to 255	Number of send telegram, the interface sends data if there are changes regarding the last value
2	Data length	0 to L-3	Number of following send data bytes
3 to L-1	Send data	0 to 255	Send data for interface

Tab. 30 PAA data communication Art. No. 56761

Bit assignment command in Byte 0 of the communication output data

Bit	Name	Value	Significance
0	Receive request	0 to 1	Request for receive data in request mode - if contents does not equal status bit 0
1	Reset	0 to 1	1: Initialize communication interface, delete contents of data buffer, delete remanent errors
2	Delete RX buffer	0 to 1	1: Delete content receive buffer
3	Reserved	0	
4	Delete TX buffer	0 to 1	1: Delete contents send buffer
5	Reserved	0	
6	Delete receive error	0 to 1	1: Reset status remanent receive error
7	Reserved	0	

Tab. 31 PAA data command byte Art. No. 56761

Receive Data from Communication Interface

If the status of the communication interface changes, the change is mapped in byte 0 of the communication input data, irrespective if complete telegrams were received. The received telegrams are displayed depending on the transfer protocol selected:

Transfer Protocol Polling

The receive counter in byte no. 1 of the communication input data is incremented by one with every telegram received via the communication interface. When the value 255 is reached, value 0 is taken.

The receive counter in byte no. 1 of the communication input data has to be read out cyclically (polling) and compared with the former value, to find out if a complete telegram was received via the communication interface. In the following, the receive data including data length can be read from byte no. 3 in the communication input data.

If there is an increase of more than one in the communication input data compared to the former value of the receive counter in byte no. 1, this means that telegrams have been received in the meantime, whose contents can no longer be identified.

Transfer Protocol Request

You can find out if complete telegrams are available in the receive buffer, by evaluating bit no. 2 and 3 of the status by in byte no. 1 of the communication input data. If a telegram is available to be read, the request bit no. 0 of the command byte in byte no. 1 of the communication output data must be set to the complementary value of the request status bit no. 0 in byte no. 1 in the communication input data. This means, the value in the communication output data has to be set to 0, if the value in the communication input data was 1 and vice versa. This releases a request for receive data (request).

In the following, the contents of the received telegram including data length can be read from byte no. 2 in the communication input data. The receive counter in byte no. 1 of the communication input data is incremented by one (compared to the state before receive data were requested) or set to 0, if the state before was 255.

The receive counter in byte no. 1 of the communication input data is not changed and the communication input data from byte 2 are set to 0, if receive data were requested, without at least one complete telegram available in the receive buffer.

Send Data from Communication Interface

Commands via byte no. 0 in the communication output data for the communication interface can be sent independently of the send data. If you want to send only one command, make sure not to change the send counter in byte no. 1 of the communication output data.

When sending data, keep the following chronological order, to avoid sending unwanted data via the communication interface:

1. Write access to the send data including length byte from byte no. 2 in the communication output data. No write access is required, if the same data shall be send again via the communication interface..
2. Write access to command byte no. 0 in the communication output data. Make sure that bit no. 1 and bit no. 0 are set to 0, otherwise no data will be sent via the communication interface.
3. Write access to the send counter in byte no. 1 in the communication output data. As soon as the values available in the send counter are changed, the send data are sent via the communication interface.

You can determine the state of the send buffer and avoid an overflow caused by additional send data, by evaluating bit no. 4 and 5 of the status byte no. 1 of the communication input data.

8.2.5.2 Data with Useful Data Protocol SEW-MOVIMOT

Byte Assignment of I/O Data – Process Input Data PE

The length of the process input data L is determined in words in the configuration by a virtual input module with prefix "MOVIMOT_RX". A word consists of two bytes. Length L results from the number following the prefix.

Byte assignment of process input data with input data length of 2 words ("MOVIMOT_RX_2 Word")

Word	Name	Value	Meaning
0	Status word 1	0 to 65535	PDU date in protocol SEW-MOVILINK
1	Output current	0 to 65535	PDU date in protocol SEW-MOVILINK

Tab. 32 PE data 2 words SEW-MOVILINK Art. No. 56761

Byte assignment of process input data with input data length of 3 words ("MOVIMOT_RX_3 Word")

Word	Name	Value	Meaning
0	Status word 1	0 to 65535	PDU date in protocol SEW-MOVILINK
1	Output current	0 to 65535	PDU date in protocol SEW-MOVILINK
2	Status word 2	0 to 65535	PDU date in protocol SEW-MOVILINK or 0

Tab. 33 PE data 3 words SEW-MOVILINK Art. No. 56761

The length of PE data in the response telegram of the SEW-MOVILINK protocol depends on the selected length of the PA data. 2 words of PA data result in 2 words of PE data. The same applies to 3 words of PA data. If there is a difference in data length in the configuration, Word 3 is either set to zero (RX 3 words, "MOVIMOT_RX_3 Word" module and TX 2 words, "MOVIMOT_TX_2 Word" module), or rejected (RX 2 words, "MOVIMOT_RX_2 Word" module, and TX 3 words, "MOVIMOT_TX_3 Word" module).

If no response telegram is received within 1 second, the process input data are completely reset to zero. This is also the case if the data frame in the response telegram of the SEW-MOVILINK is incorrect.

Byte Assignment of I/O Data – Process Output Data PA

The length of the process output data L is determined in words in the configuration by a virtual output module with prefix "MOVIMOT_TX". A word consists of two bytes. Length L results from the number following the prefix.

Byte assignment of process output data with output data length of 2 words ("MOVIMOT_TX_2 Word")

Word	Name	Value	Meaning
0	Control word	0 to 65535	PDU date in protocol SEW-MOVILINK
1	Revolutions	0 to 65535	PDU date in protocol SEW-MOVILINK

Tab. 34 PA data 2 words SEW-MOVILINK Art. No. 56761

Byte assignment of process output data with output data length of 3 words ("MOVIMOT_TX_3 Word")

Word	Name	Value	Meaning
0	Control word	0 to 65535	PDU date in protocol SEW-MOVILINK
1	Revolutions	0 to 65535	PDU date in protocol SEW-MOVILINK
2	Ramp status word	0 to 65535	PDU date in protocol SEW-MOVILINK or 0

Tab. 35 PA data 3 words SEW-MOVILINK Art. No. 56761

PA data are sent cyclically over the communication interface, taking account of the time specifications in the SEW-MOVILINK protocol. If an error is detected in the fieldbus, the PA data are reset to zero.

8.2.6 I&M Functions of Cube67+ DIO4 RS232/485 E 4xM12

Accesses per Master Class 2 are currently not possible. Master Class 2 accesses will be supported in a future version.

Index 65000 read = IM0 of Cube67+ DIO4 RS232/485 E 4xM12

I&M queries must always be executed at the slot of the Cube67+ DIO4 RS232/485 E 4xM12 .

8.3 Cube67+ DIO12 IOL4 E 8xM12 Art. No. 56765

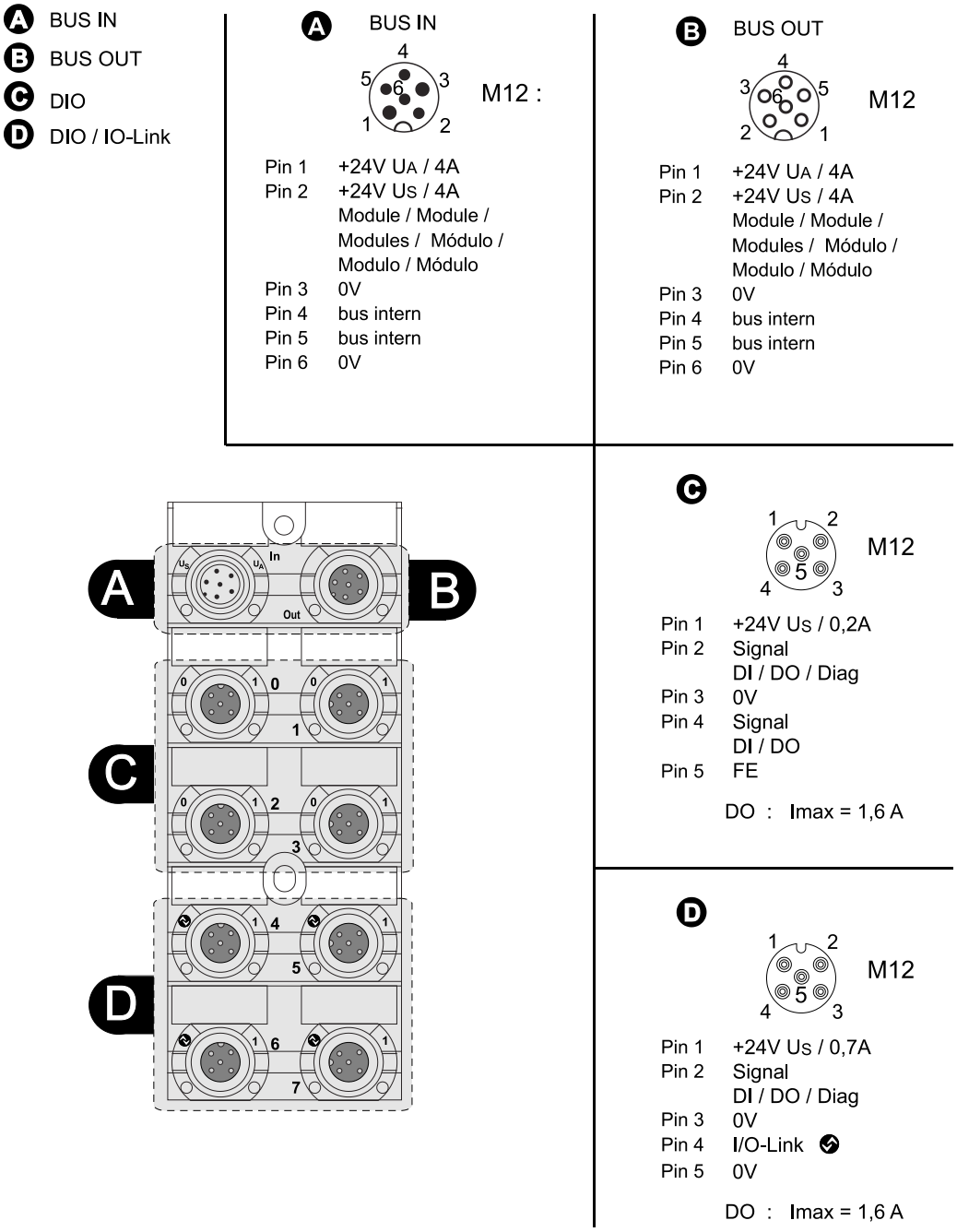


Fig. 15 Pin assignment and connection overview

8.3.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
Cube67+ DIO12 IOL4 E 8xM12	56765	2 bytes	2 bytes	$C3_{hex}01_{hex}$ 01_{hex} DD_{hex} BD_{hex} 06_{hex}

Tab. 36 Identification Art. No. 56765

The complete identification of the Cube67+ DIO12 IOL4 E 8xM12 is composed of the above listed identification and 4 following identifications for 4 virtual I/O link modules. Please refer to the associated GSD file for the identifications of the IO link modules.

8.3.2 Baud rates

The four IO link masters of CUBE67+ DIO12 IOL4 E 8xM12 Art. No. 56765 support all three IO link baud rates according to IO Link Communication Specification 1.0

8.3.3 Parameters

Number of parameter bytes: 18

Bit assignment of parameter Byte 0

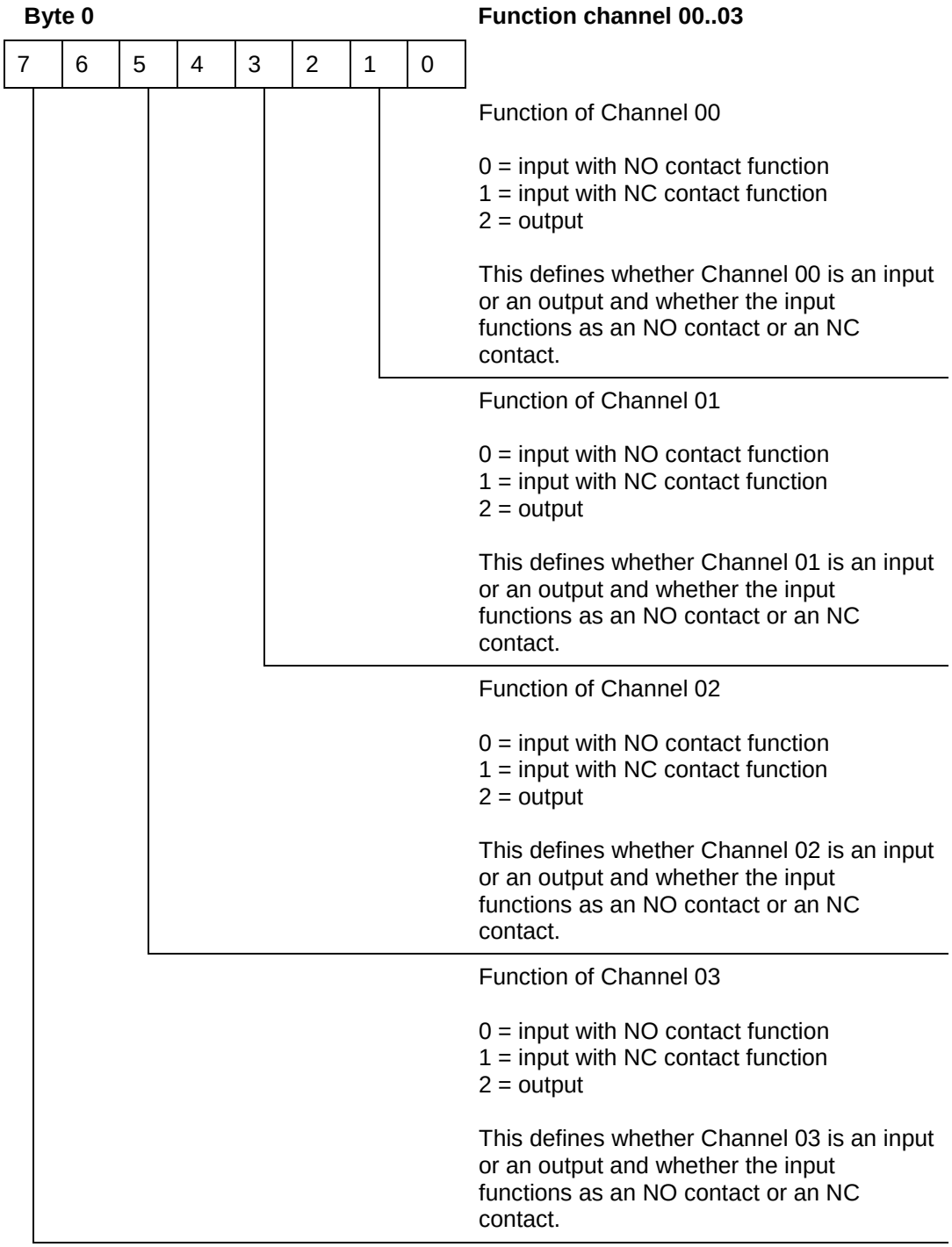

Byte 0
Function channel 00..03
7
6
5
4
3
2
1
0
Function of Channel 00
0 = input with NO contact function
1 = input with NC contact function
2 = output
This defines whether Channel 00 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 01
0 = input with NO contact function
1 = input with NC contact function
2 = output
This defines whether Channel 01 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 02
0 = input with NO contact function
1 = input with NC contact function
2 = output
This defines whether Channel 02 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 03
0 = input with NO contact function
1 = input with NC contact function
2 = output
This defines whether Channel 03 is an input or an output and whether the input functions as an NO contact or an NC contact.

Fig. 16 Parameter byte 0 Art.No. 56765

Bit assignment of parameter Byte 1

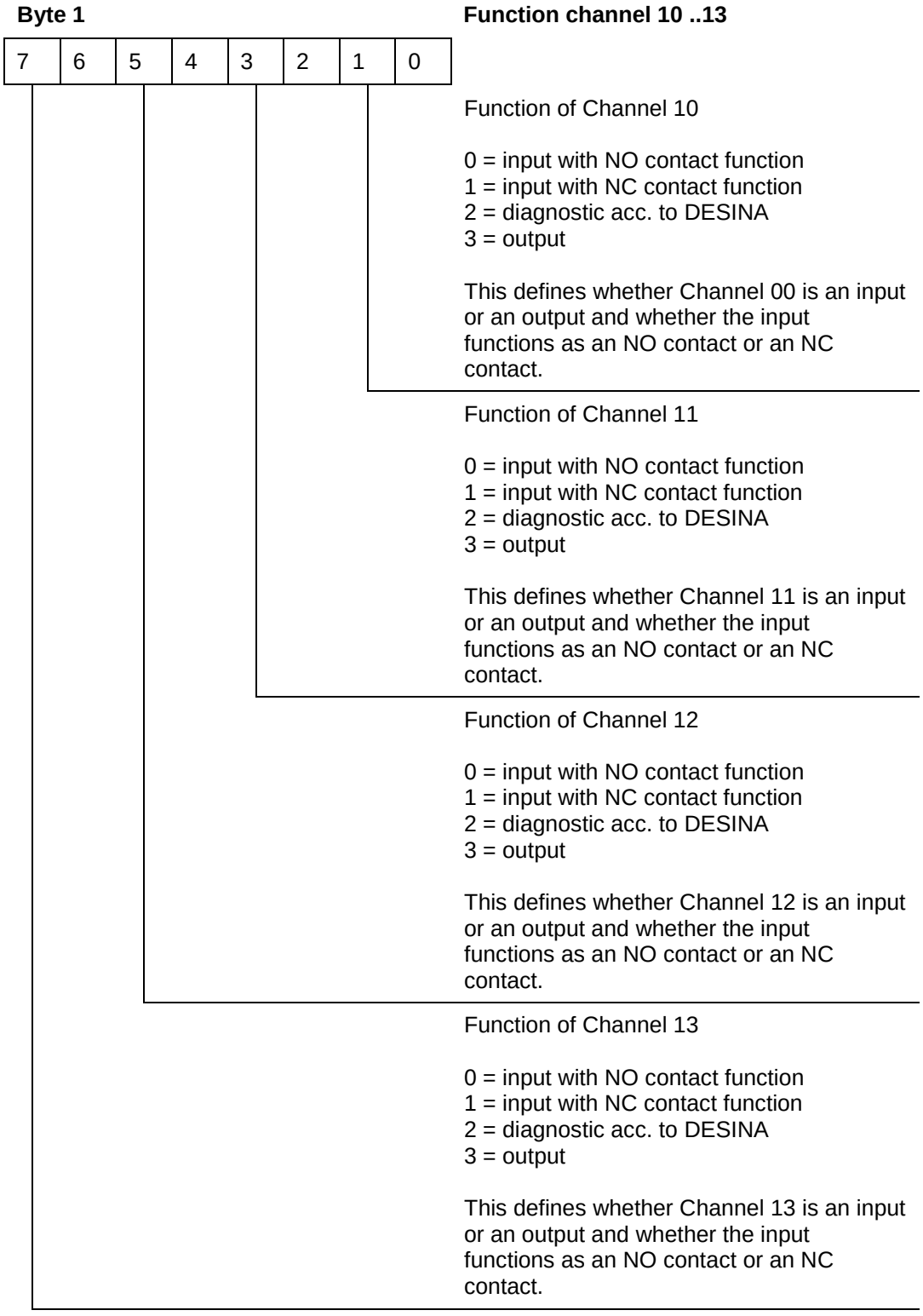

Byte 1
Function channel 10 ..13
7
6
5
4
3
2
1
0
Function of Channel 10
0 = input with NO contact function
1 = input with NC contact function
2 = diagnostic acc. to DESINA
3 = output
This defines whether Channel 00 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 11
0 = input with NO contact function
1 = input with NC contact function
2 = diagnostic acc. to DESINA
3 = output
This defines whether Channel 11 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 12
0 = input with NO contact function
1 = input with NC contact function
2 = diagnostic acc. to DESINA
3 = output
This defines whether Channel 12 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 13
0 = input with NO contact function
1 = input with NC contact function
2 = diagnostic acc. to DESINA
3 = output
This defines whether Channel 13 is an input or an output and whether the input functions as an NO contact or an NC contact.

Fig. 17 Parameter byte 1 Art.No. 56765

Bit assignment of parameter Byte 2

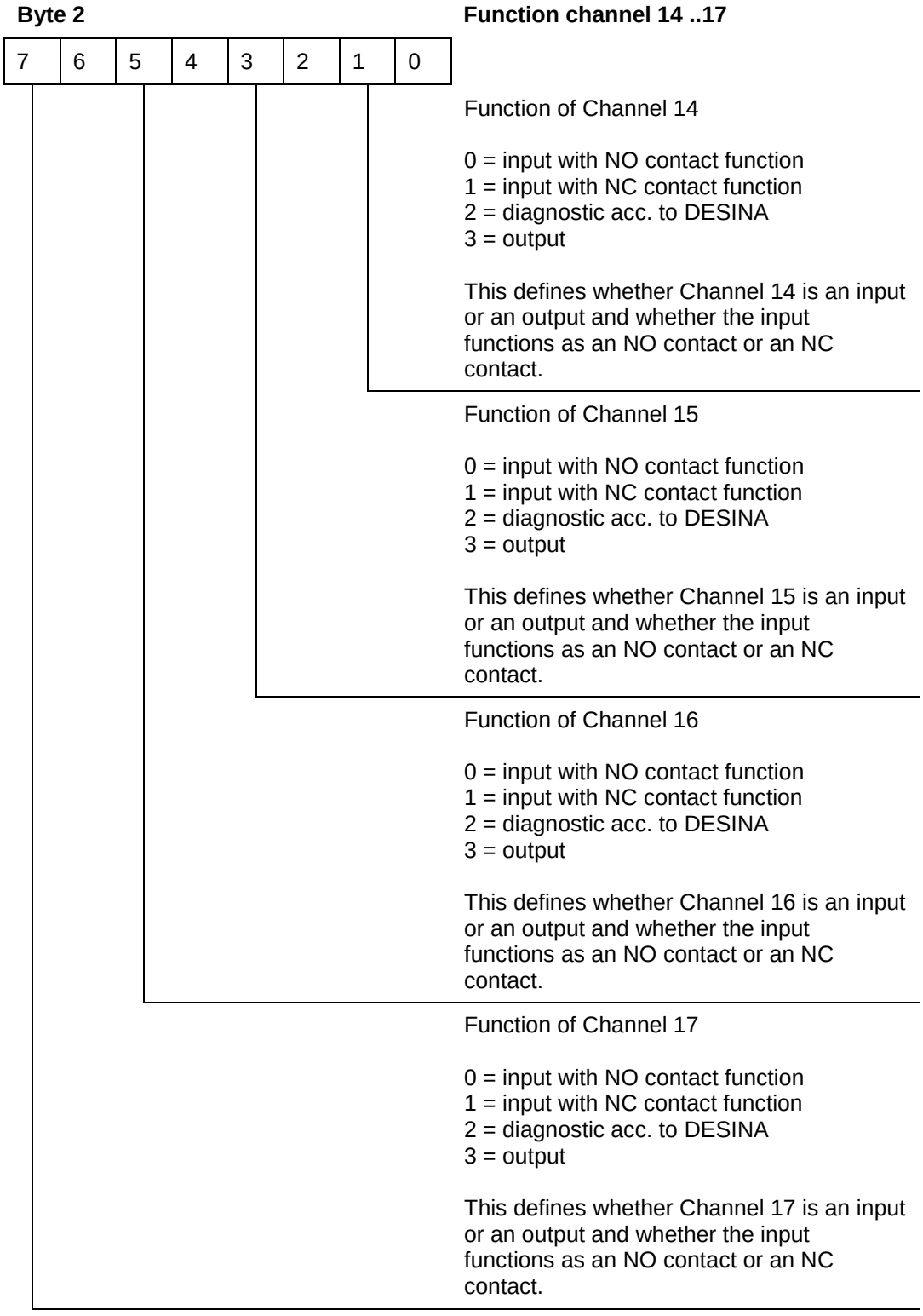

Byte 2
Function channel 14 ..17
7
6
5
4
3
2
1
0
Function of Channel 14
0 = input with NO contact function
1 = input with NC contact function
2 = diagnostic acc. to DESINA
3 = output
This defines whether Channel 14 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 15
0 = input with NO contact function
1 = input with NC contact function
2 = diagnostic acc. to DESINA
3 = output
This defines whether Channel 15 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 16
0 = input with NO contact function
1 = input with NC contact function
2 = diagnostic acc. to DESINA
3 = output
This defines whether Channel 16 is an input or an output and whether the input functions as an NO contact or an NC contact.
Function of Channel 17
0 = input with NO contact function
1 = input with NC contact function
2 = diagnostic acc. to DESINA
3 = output
This defines whether Channel 17 is an input or an output and whether the input functions as an NO contact or an NC contact.

Fig. 18 Parameter byte 2 Art. No. 56765

Bit assignment of parameter bytes 3..5

0 (reserved)

Bit assignment of parameter Byte 6

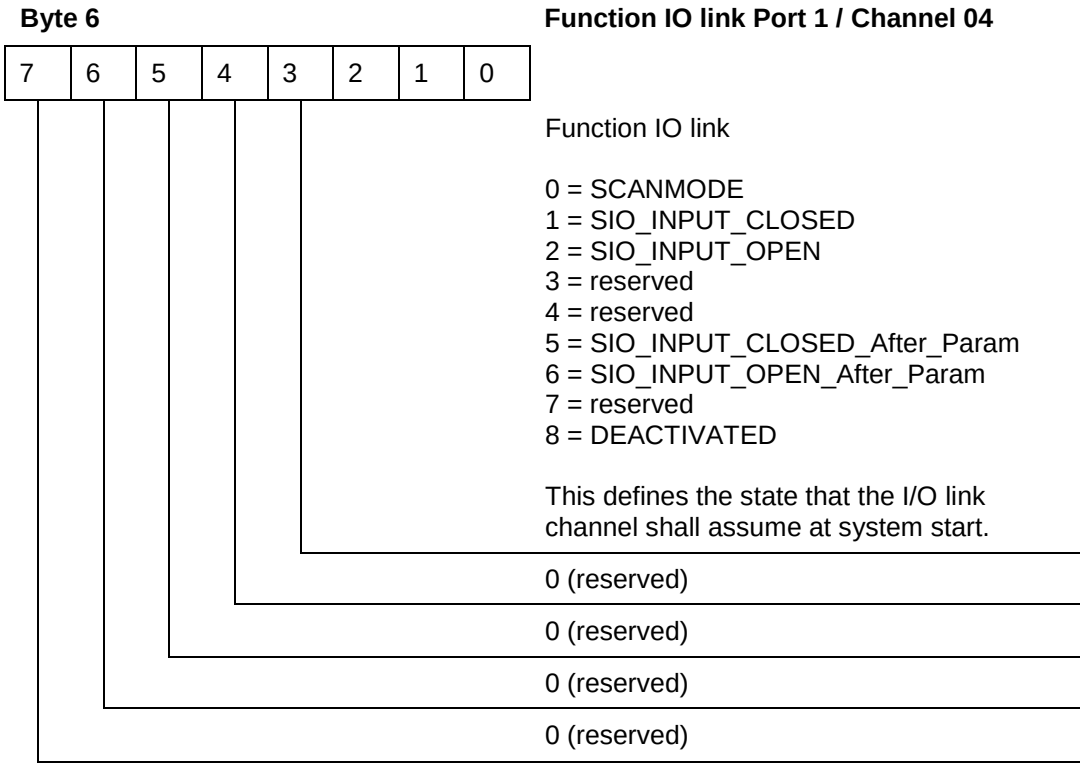


Fig. 19 Parameter byte 6 Art. No. 56765

Bit assignment of parameter Byte 7

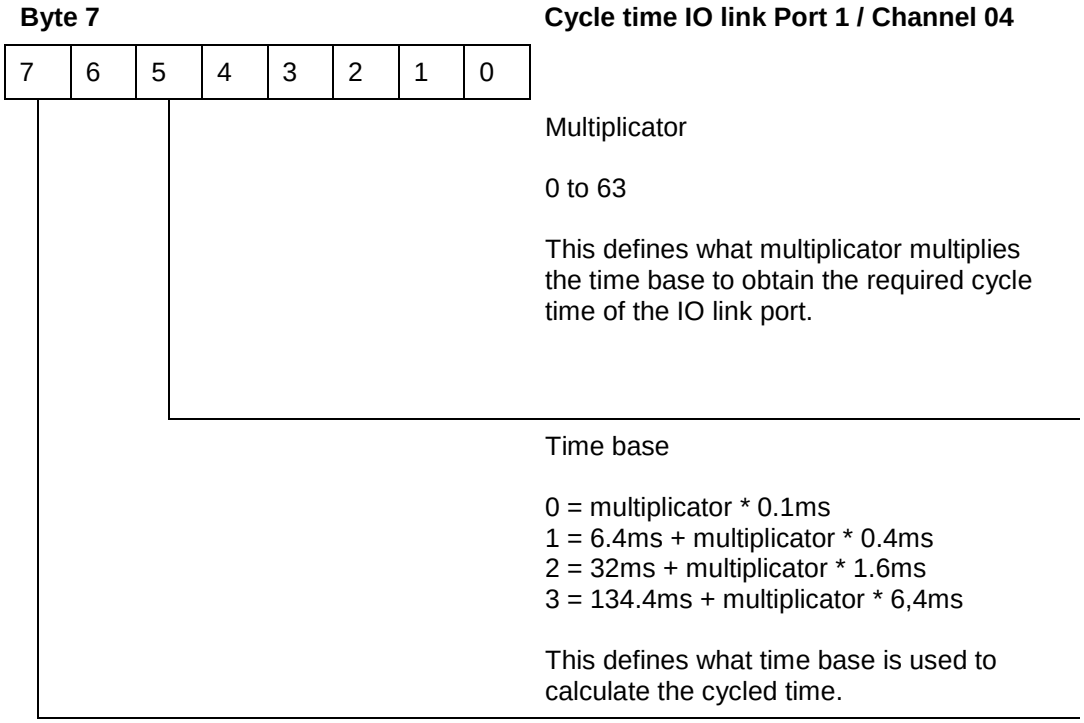

Byte 7
Cycle time IO link Port 1 / Channel 04
7 6 5 4 3 2 1 0
Multiplicator
0 to 63
This defines what multiplicator multiplies the time base to obtain the required cycle time of the IO link port.
Time base
0 = multiplicator * 0.1ms
1 = 6.4ms + multiplicator * 0.4ms
2 = 32ms + multiplicator * 1.6ms
3 = 134.4ms + multiplicator * 6,4ms
This defines what time base is used to calculate the cycled time.

Fig. 20 Parameter byte 7 Art. No. 56765

Bit assignment of parameter Byte 8

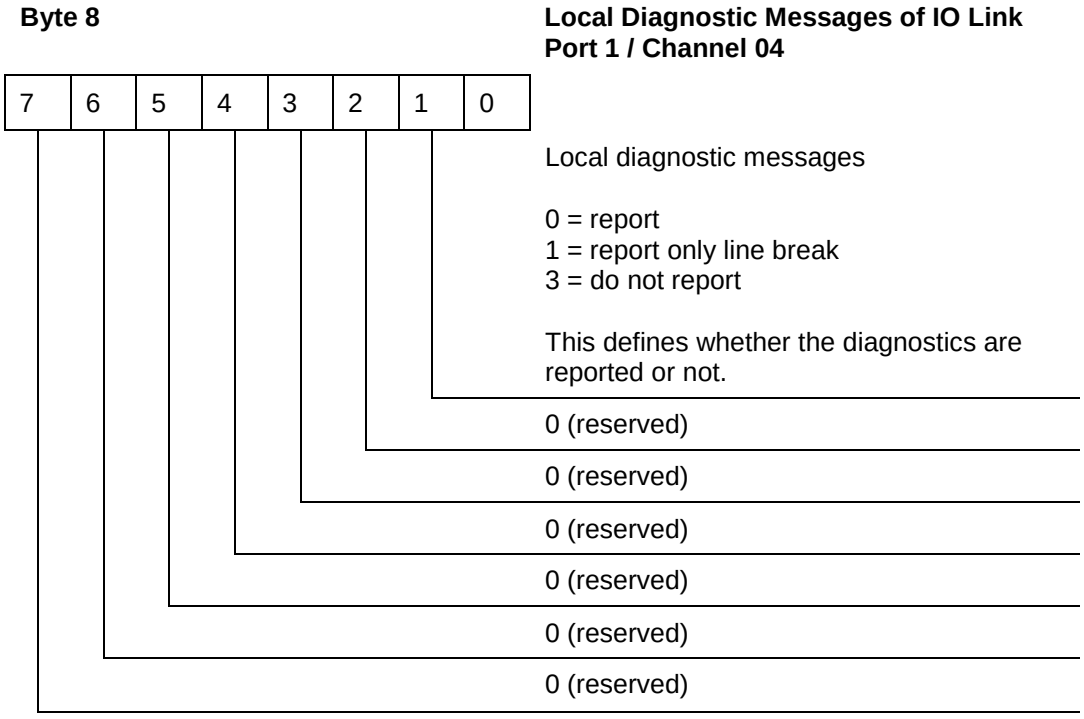

Byte 8
Local Diagnostic Messages of IO Link Port 1 / Channel 04
7 6 5 4 3 2 1 0
Local diagnostic messages
0 = report
1 = report only line break
3 = do not report
This defines whether the diagnostics are reported or not.
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)

Fig. 21 Parameter byte 8 Art. No. 56765

Bit assignment of parameter Byte 9

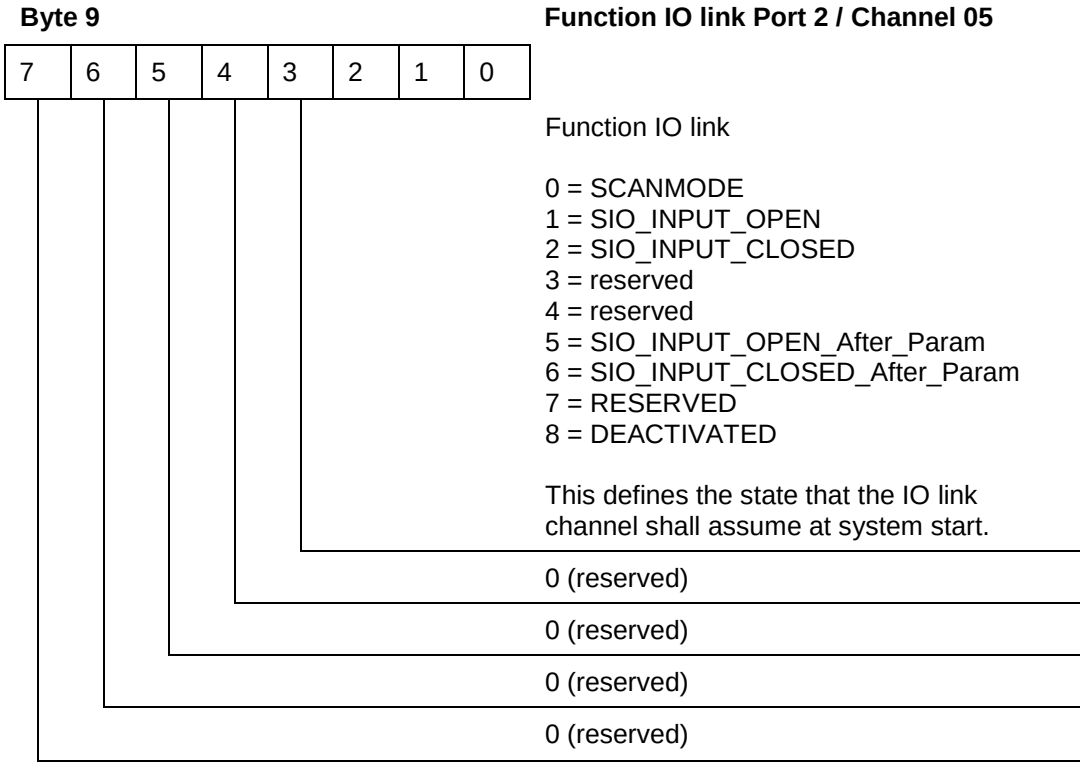


Fig. 22 Parameter byte 9 Art. No. 56765

Bit assignment of parameter Byte 10

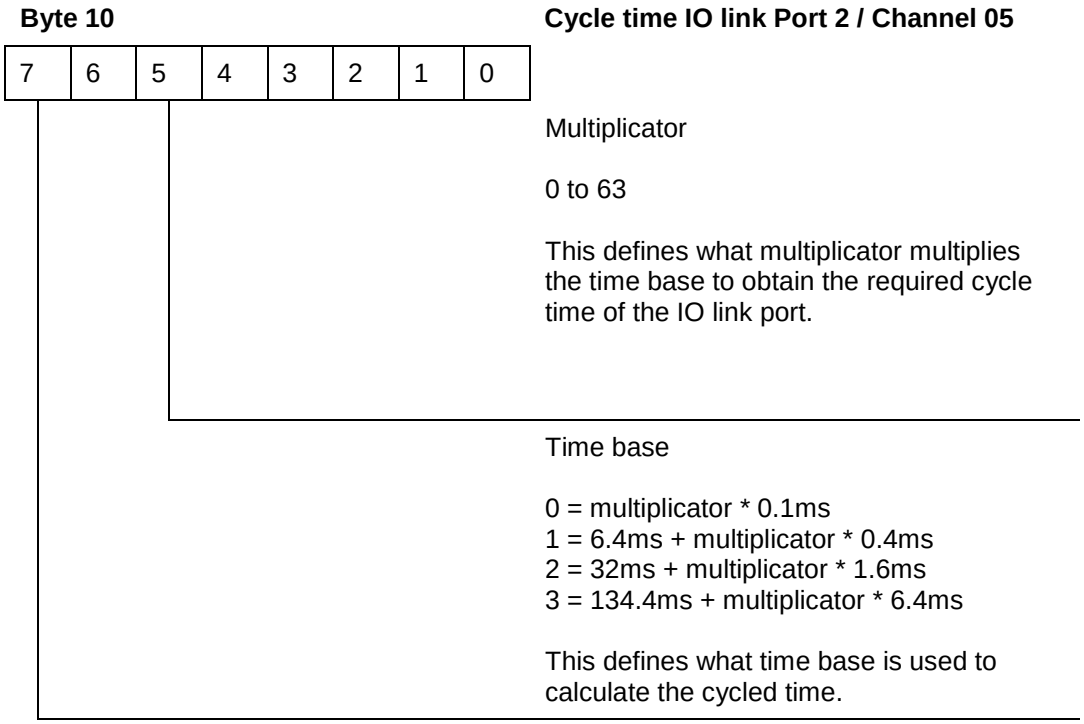

Byte 10
Cycle time IO link Port 2 / Channel 05
7 6 5 4 3 2 1 0
Multiplicator
0 to 63
This defines what multiplicator multiplies the time base to obtain the required cycle time of the IO link port.
Time base
0 = multiplicator * 0.1ms
1 = 6.4ms + multiplicator * 0.4ms
2 = 32ms + multiplicator * 1.6ms
3 = 134.4ms + multiplicator * 6.4ms
This defines what time base is used to calculate the cycled time.

Fig. 23 Parameter byte 10 Art. No. 56765

Bit assignment of parameter Byte 11

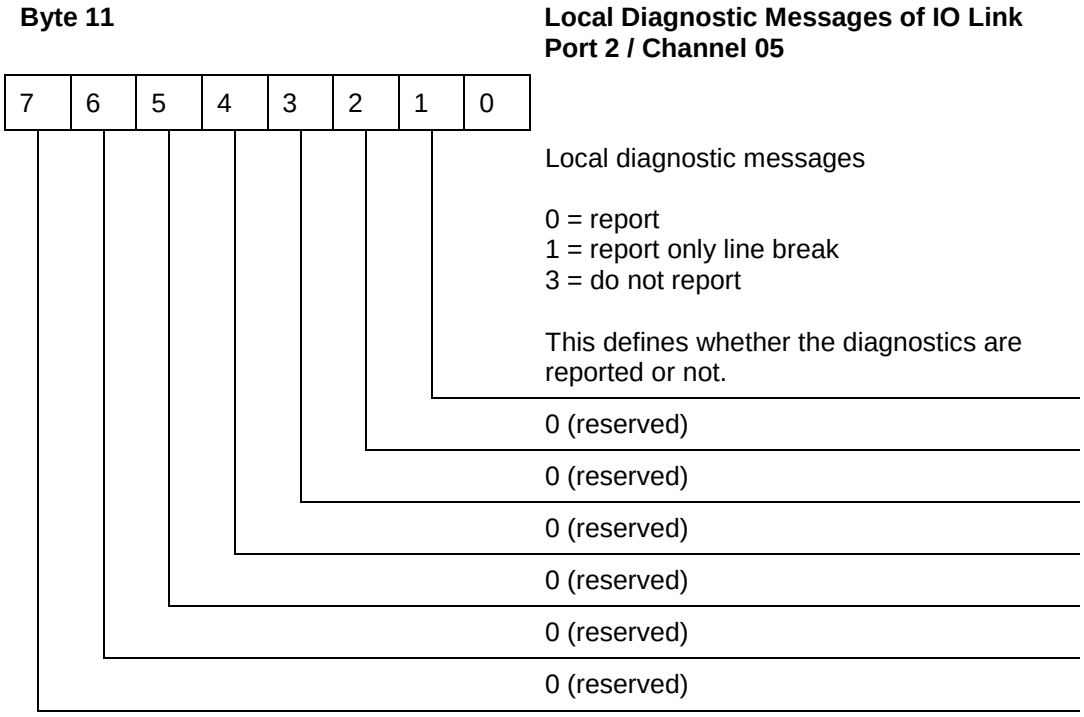

Byte 11
Local Diagnostic Messages of IO Link Port 2 / Channel 05
7 6 5 4 3 2 1 0
Local diagnostic messages
0 = report
1 = report only line break
3 = do not report
This defines whether the diagnostics are reported or not.
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)

Fig. 24 Parameter byte 11 Art. No. 56765

Bit assignment of parameter Byte 12

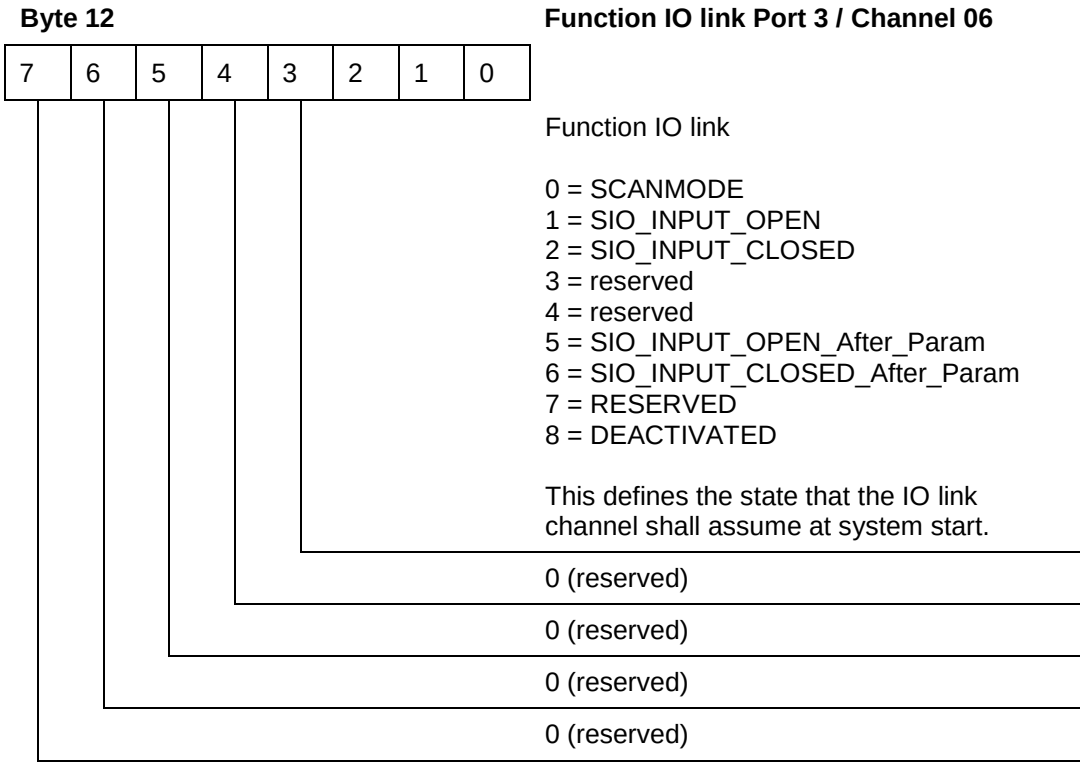


Fig. 25 Parameter byte 12 Art. No. 56765

Bit assignment of parameter Byte 13

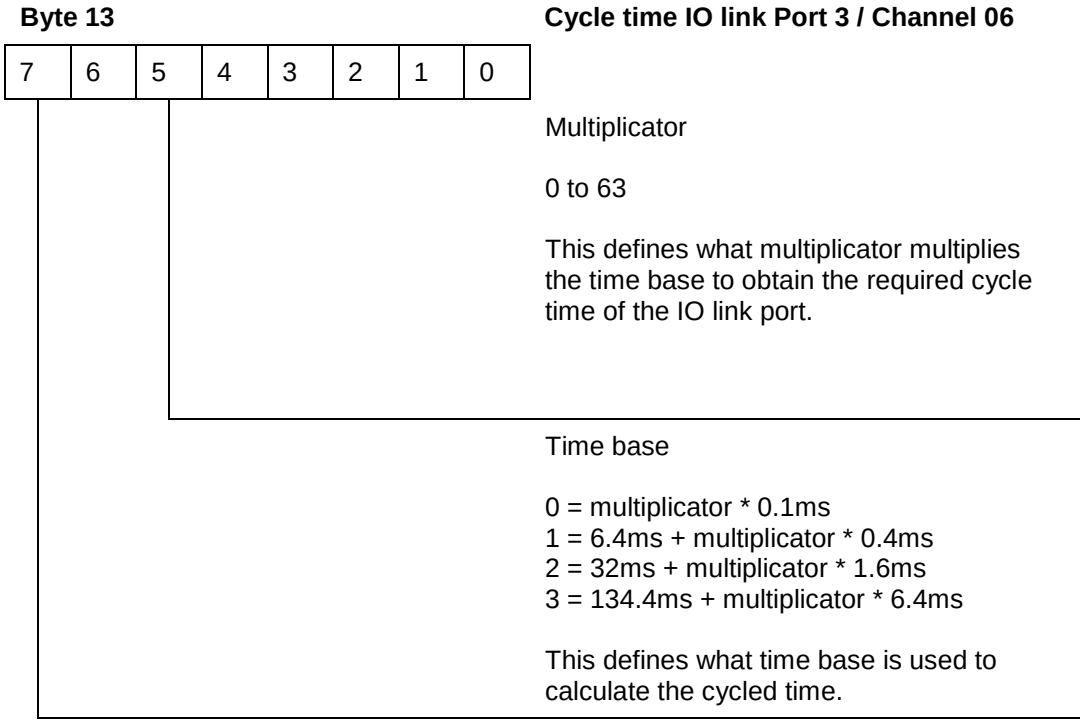

Byte 13
Cycle time IO link Port 3 / Channel 06
7 6 5 4 3 2 1 0
Multiplicator
0 to 63
This defines what multiplicator multiplies the time base to obtain the required cycle time of the IO link port.
Time base
0 = multiplicator * 0.1ms
1 = 6.4ms + multiplicator * 0.4ms
2 = 32ms + multiplicator * 1.6ms
3 = 134.4ms + multiplicator * 6.4ms
This defines what time base is used to calculate the cycled time.

Fig. 26 Parameter byte 13 Art. No. 56765

Bit assignment of parameter Byte 14

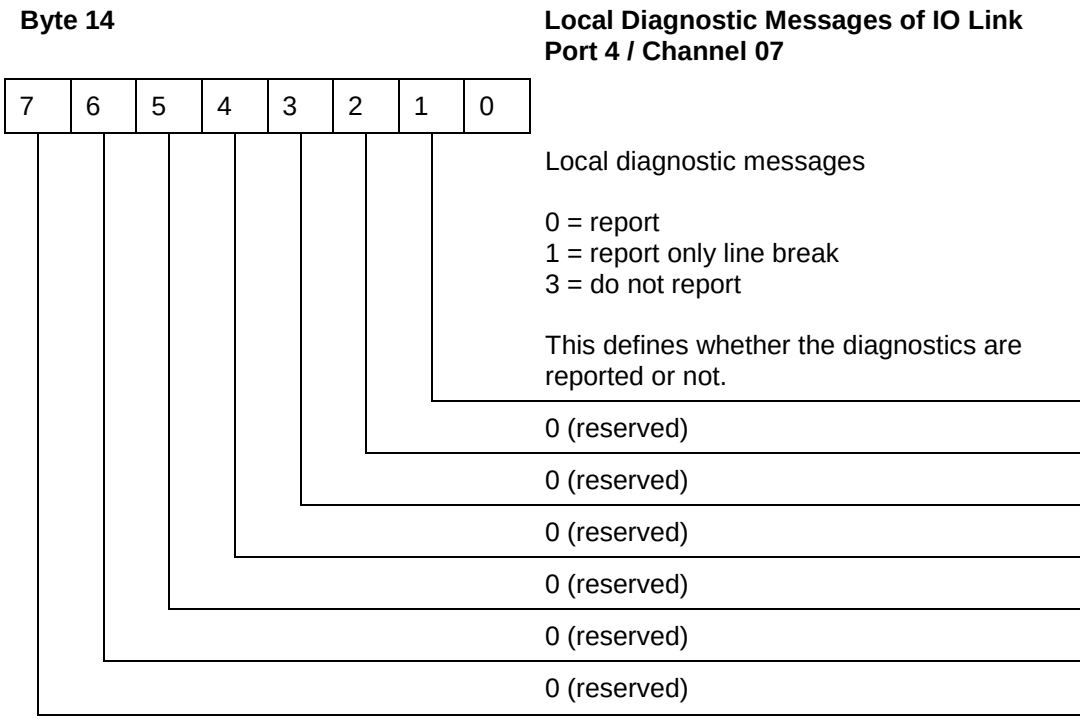

Byte 14
Local Diagnostic Messages of IO Link Port 4 / Channel 07
7 6 5 4 3 2 1 0
Local diagnostic messages
0 = report
1 = report only line break
3 = do not report
This defines whether the diagnostics are reported or not.
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)
0 (reserved)

Fig. 27 Parameter byte 14 Art. No. 56765

Bit assignment of parameter Byte 15

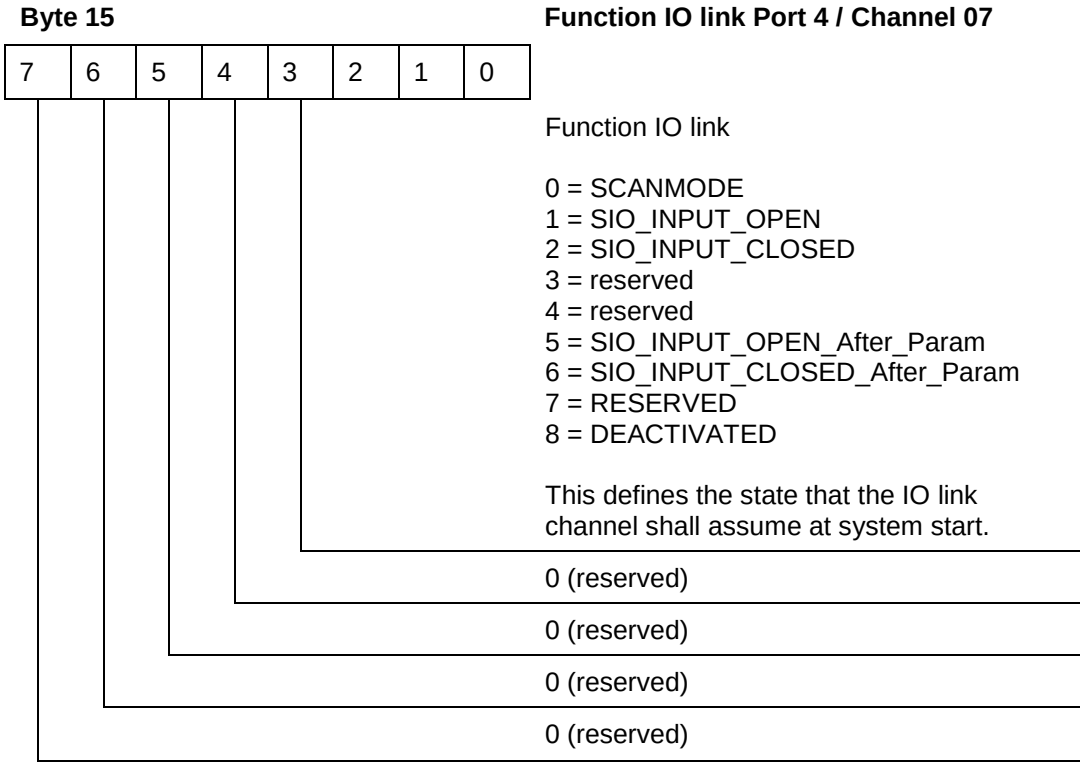


Fig. 28 Parameter byte 15 Art. No. 56765

Bit assignment of parameter Byte 16

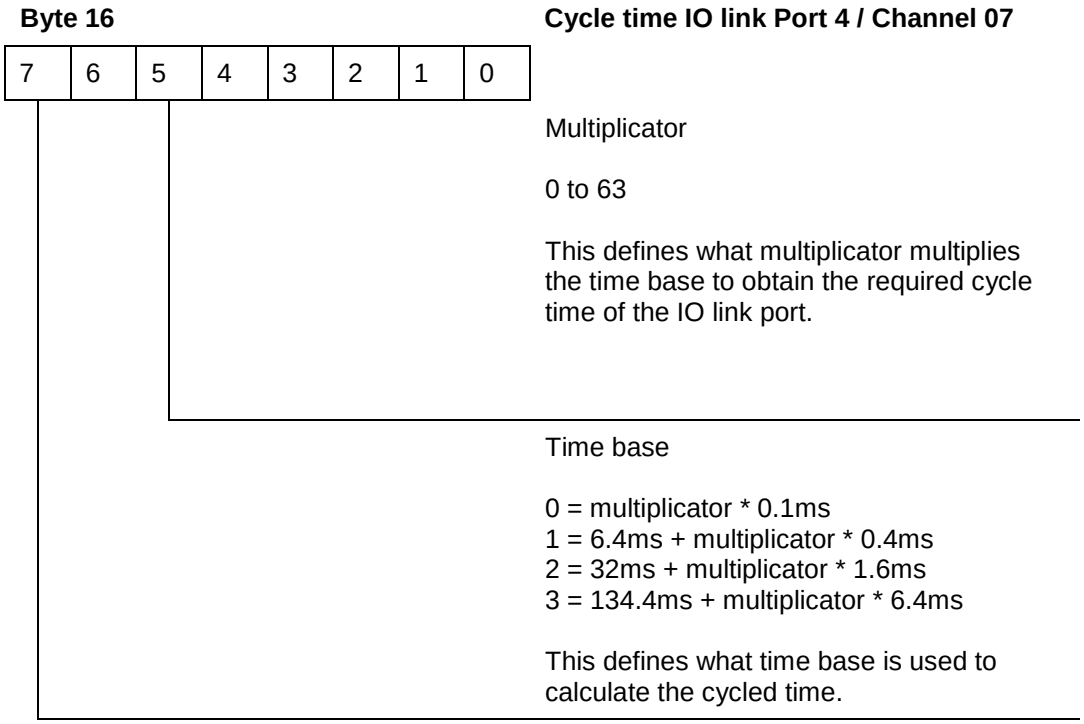

Byte 16
Cycle time IO link Port 4 / Channel 07
7 6 5 4 3 2 1 0
Multiplicator
0 to 63
This defines what multiplicator multiplies the time base to obtain the required cycle time of the IO link port.
Time base
0 = multiplicator * 0.1ms
1 = 6.4ms + multiplicator * 0.4ms
2 = 32ms + multiplicator * 1.6ms
3 = 134.4ms + multiplicator * 6.4ms
This defines what time base is used to calculate the cycled time.

Fig. 29 Parameter byte 16 Art. No. 56765

Bit assignment of parameter Byte 17

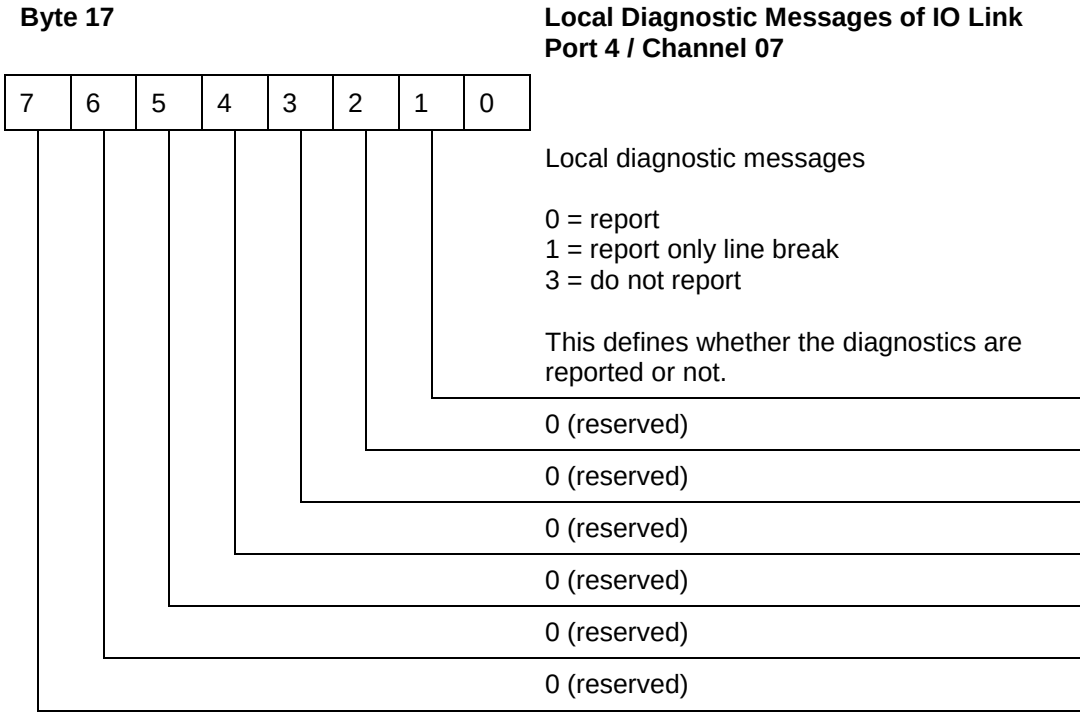


Fig. 30 Parameter byte 17 Art. No. 56765

8.3.4 Data Cube67+ DIO12 IOL4 E 8xM12

Bit assignment I/O data - input data PAE

Byte 0								
Bit	7	6	5	4	3	2	1	0
Pin 4 Socket	7	6	5	4	3	2	1	0

Tab. 37 PAE data byte 1 Art. No. 56765

Byte 1								
Bit	7	6	5	4	3	2	1	0
Pin 2 Socket	7	6	5	4	3	2	1	0

Tab. 38 PAE data byte 2 Art. No. 56765

Bit assignment I/O data - output data PAA

Byte 0								
Bit	7	6	5	4	3	2	1	0
Pin 4 Socket	7	6	5	4	3	2	1	0

Tab. 39 PAE data byte 1 Art. No. 56765

Byte 1								
Bit	7	6	5	4	3	2	1	0
Pin 2 Socket	7	6	5	4	3	2	1	0

Tab. 40 PAE data byte 2 Art. No. 56765

In addition to the 2 bytes for PAE and PAA each, the configured IO Link PAE and PAA bytes are transmitted. The data length depends on the virtual modules used.

8.3.5 I&M Functions of Cube67+ DIO12 IOL4 E 8xM12

For communication with the IO link sensors, the Cube67+ DIO12 IOL4 E 8xM12 also supports I&M functions. They are used for communication with the IO link devices as well as to represent module-specific information.

Index 65000 read = IM0 of Cube67+ DIO12 IOL4 E 8xM12

Index 65016 read = IO – Link – MM acc. to specification

Index 65017 read = IM17 information from IO – Link Port 1

Index 65018 read = IM18 information from IO – Link Port 2

Index 65019 read = IM19 information from IO – Link Port 3

Index 65020 read = IM20 information from IO – Link Port 4

Index 65098 read and write = communication channel to connected IO link devices

Index 65099 read = IO – Link Master Directory

I&M queries must always be requested at the slot of the Cube67+ DIO12 IOL4 E 8xM12. For port-related IO link queries via IM98 (65098), the requested port is contained in the I/O link protocol (Ports 1 to 4)

9 Cube20-Module

For the Cube67 BN-P, the Cube20 modules described in this chapter can only be used via the module Cube20 BN67 DIO8 Art. No. 56450.

9.1 Cube20 BN67 DIO8 – Art. No. 56450

9.1.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
Cube20 DIO8 M12	56450	1 byte	1 byte	$C3_{hex}$ 00_{hex} 00_{hex} DC_{hex} 82_{hex} 01_{hex}

Tab. 41 Identification of Cube20 BN67 DIO8 – Art.-No. 56450

9.1.2 Bit assignment I/O - Data

9.1.2.1 Input Data IDM

Byte 0 (Terminal X3)					Byte 0 (Terminal X2)			
Bit	7	6	5	4	3	2	1	0
Channel	03	02	01	00	03	02	01	00

Tab. 42 Input data Cube20 BN67 DIO8 – Art.-No. 56450

9.1.2.2 Output Data ODM

Byte 0 (Terminal X3)					Byte 0 (Terminal X2)			
Bit	7	6	5	4	3	2	1	0
Channel	03	02	01	00	03	02	01	00

Tab. 43 Output data Cube20 BN67 DIO8 – Art.-No. 56450

9.1.3 Parameterization

Length of the parameter: 1 Byte.

9.1.3.1 Function Channel X2 00…03 and X3 00…03

Decimal	Bit 0	Signification
0	0	NO input
1	1	Output

Tab. 44 Function channel X2 00…03 und X3 00…03 Cube20 BN67 DIO8

9.1.4 Bit Assignment of the Parameter Bytes

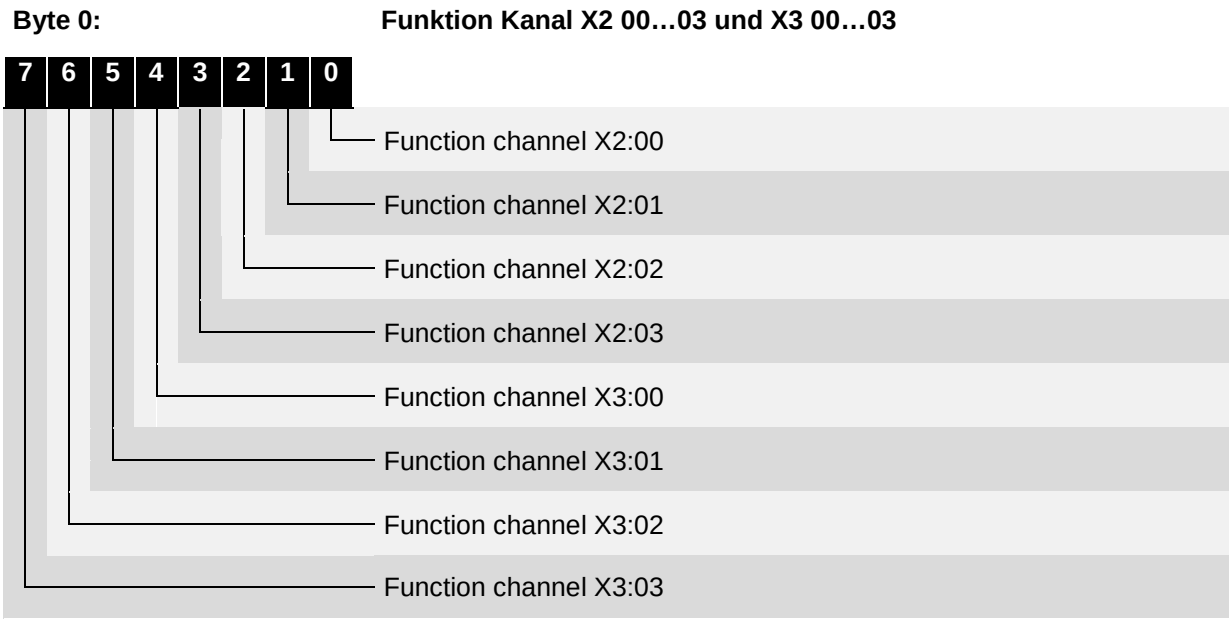


Fig. 31 Parameterbyte 0 Cube20 BN67 DIO8 – Art.-No. 56450

9.2 Cube20 DI32 Art. No.: 56112

9.2.1 Identification

Description	Art.	Process data		Identification
		Input	Output	
Cube20 DI32	56112	4 bytes	0 byte	43_{hex} 03_{hex} DB_{hex} 30_{hex} 00_{hex}

Tab. 45 Identification of Cube20 DI32 Art.-No. 56112

9.2.2 Number and Bit Assignment of Parameter Bytes

Number of Parameter bytes: 0

9.2.3 bit assignment I/O – Data – Input data IDM

Byte 0								
Bit	7	6	5	4	3	2	1	0
Terminal	X0 07	X0 06	X0 05	X0 04	X0 03	X0 02	X0 01	X0 00
Byte 1								
Bit	7	6	5	4	3	2	1	0
Terminal	X1 07	X1 06	X1 05	X1 04	X1 03	X1 02	X1 01	X1 00
Byte 2								
Bit	7	6	5	4	3	2	1	0
Terminal	X2 07	X2 06	X2 05	X2 04	X2 03	X2 02	X2 01	X2 00
Byte 3								
Bit	7	6	5	4	3	2	1	0
Terminal	X3 07	X3 06	X3 05	X3 04	X3 03	X3 02	X3 01	X3 00

Tab. 46 Input Data Cube 20 DI32 Art. No.: 56112

9.3 Cube20 DO16 Art. No.: 56117

9.3.1 Identification

Description	Art.	Process data		Identification
		Input	Output	
Cube20 DO16	56117	0 byte	4 bytes	83_{hex} 01_{hex} DB_{hex} 35_{hex} 00_{hex}

Tab. 47 Identification of Cube20 DO16 Art.-No.: 56117

9.3.2 Number and Bit Assignment of Parameter Bytes

Number of Parameter bytes: 0

9.3.3 Bit Assignment I/O – Data – Input data IDM

	Byte 0							
Bit	7	6	5	4	3	2	1	0
Klemme	X1 03	X1 02	X1 01	X1 00	X0 03	X0 02	X0 01	X0 00
	Byte 1							
Bit	7	6	5	4	3	2	1	0
Klemme	X3 03	X3 02	X3 01	X3 00	X2 03	X2 02	X2 01	X2 00

Tab. 48 Ausgangsdaten Cube20 DO16 Art.-No.: 56117

9.4 Cube20 DO32 Art. No.: 56118

9.4.1 Kennung

Description	Art.	Process data		Identification
		Input	Output	
Cube20 DO32	56118	0 byte	4 bytes	83_{hex} 03_{hex} DB_{hex} 36_{hex} 00_{hex}

Tab. 49 Identification of Cube20 DO32 Art.-No. 56118

9.4.2 Number and Bit Assignment of Parameter Bytes

Number of Parameter bytes: 0

9.4.3 Bit assignment I/O – Data – Output Data ODM

Byte 0								
Bit	7	6	5	4	3	2	1	0
Terminal	X0 07	X0 06	X0 05	X0 04	X0 03	X0 02	X0 01	X0 00
Byte 1								
Bit	7	6	5	4	3	2	1	0
Terminal	X1 07	X1 06	X1 05	X1 04	X1 03	X1 02	X1 01	X1 00
Byte 2								
Bit	7	6	5	4	3	2	1	0
Terminal	X2 07	X2 06	X2 05	X2 04	X2 03	X2 02	X2 01	X2 00
Byte 3								
Bit	7	6	5	4	3	2	1	0
Terminal	X3 07	X3 06	X3 05	X3 04	X3 03	X3 02	X3 01	X3 00

Tab. 50 Output data Cube20 DO32 Art.-No. 56118

9.5 Cube20 DI32 NPN / PNP Art. No. 56121

9.5.1 Identification

Description	Art.	Process data		Identification
		Input	Output	
Cube20 DI32 NPN / PNP	56121	4 byte	0 byte	43_{hex} 03_{hex} DB_{hex} 39_{hex} 00_{hex}

Tab. 51 Identification of Cube20 DI32 NPN / PNP Art. No. 56121

9.5.2 Number and Bit Assignment of Parameter Bytes

Number of Parameter bytes: 0

9.5.3 Bit assignment I/O-Data – Input Data IDM

Byte 0								
Bit	7	6	5	4	3	2	1	0
Terminal	X0 07	X0 06	X0 05	X0 04	X0 03	X0 02	X0 01	X0 00
Byte 1								
Bit	7	6	5	4	3	2	1	0
Terminal	X1 07	X1 06	X1 05	X1 04	X1 03	X1 02	X1 01	X1 00
Byte 2								
Bit	7	6	5	4	3	2	1	0
Terminal	X2 07	X2 06	X2 05	X2 04	X2 03	X2 02	X2 01	X2 00
Byte 3								
Bit	7	6	5	4	3	2	1	0
Terminal	X3 07	X3 06	X3 05	X3 04	X3 03	X3 02	X3 01	X3 00

Tab. 52 Input data Cube20 DI32 NPN / PNP Art. No. 56121

9.6 Cube20 DI16 DO16 Art. No.: 56168

9.6.1 Identification

Description	Art.	Process data		Identification
		Input	Output	
Cube20 DI16 DO16	56168	2 bytes	2 bytes	$C3_{hex}$ 01_{hex} 01_{hex} DB_{hex} 68_{hex} 00_{hex}

Tab. 53 Identification of Cube20 DI16DO16 Art.-No. 56168

9.6.2 Number and Bit Assignment of Parameter Bytes

Number of Parameter bytes: 0

9.6.3 Bit assignment I/O - Data

9.6.3.1 Bit assignment I/O – Data – Input data IDM

	Byte 0							
Bit	7	6	5	4	3	2	1	0
Terminal	X2 07	X2 06	X2 05	X2 04	X2 03	X2 02	X2 01	X2 00
	Byte 1							
Bit	7	6	5	4	3	2	1	0
Terminal	X3 07	X3 06	X3 05	X3 04	X3 03	X3 02	X3 01	X3 00

Tab. 54 nput data Cube20 DI16 DO16 Art.-No.: 56168

9.6.3.2 Bit assignment I/O-Data – Output Data ODM

	Byte 0							
Bit	7	6	5	4	3	2	1	0
Terminal	X0 07	X0 06	X0 05	X0 04	X0 03	X0 02	X0 01	X0 00
	Byte 1							
Bit	7	6	5	4	3	2	1	0
Terminal	X1 07	X1 06	X1 05	X1 04	X1 03	X1 02	X1 01	X1 00

Tab. 55 Output data Cube20 DI16 Art.-No.: 56168

9.7 Cube20 AI4 U/I Art. No.: 56200 / 56201

9.7.1 Identification of Cube20 AI4 U/I Art.-No. 56200

Description	Art. No.	Process data		Identification
		Input	Output	
Cube20 AI4 U/I	56201	4 words	0 words	43_{hex} 43_{hex} DB_{hex} 88_{hex} $0C_{hex}$

Tab. 56 Identification of Cube20 AI4 U/I Art.-No. 56200

9.7.2 Number and Bit Assignment of Parameter Bytes Cube20 AI4 U/I Art. No.: 56200

Number of Parameter bytes: 12

Bit assignment of parameter bytes 0 (channel 0), 3 (channel 1), 6 (channel 2), 9 (channel 3)

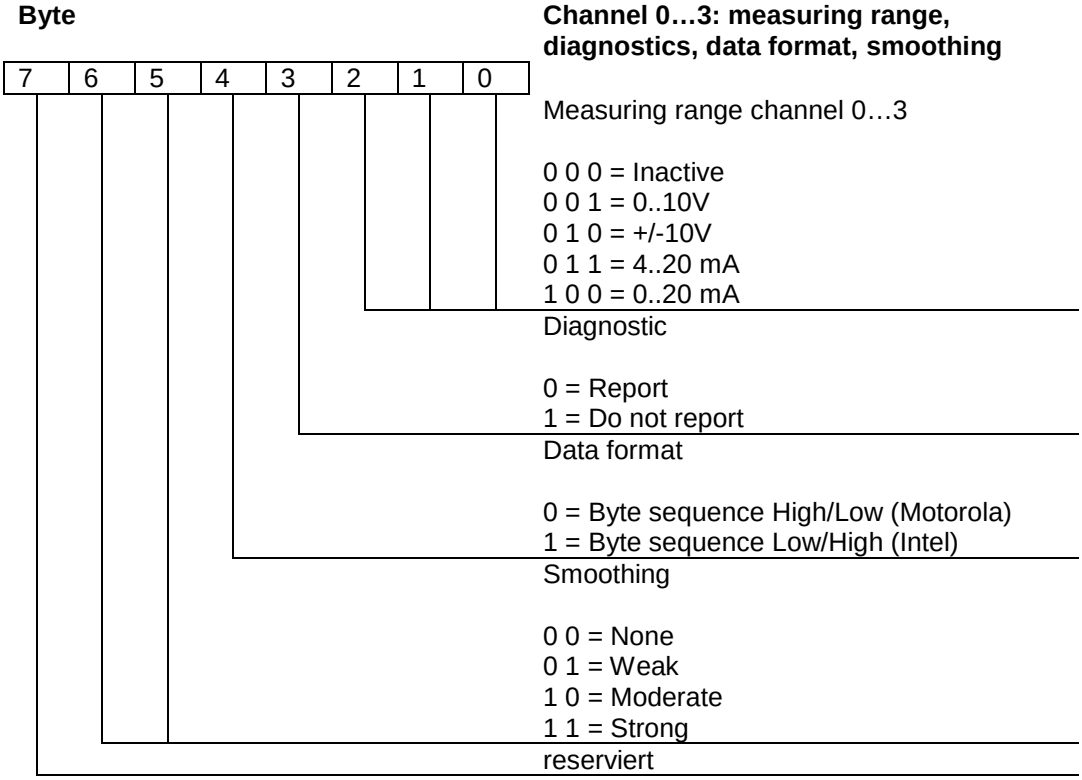

Byte
Channel 0…3: measuring range, diagnostics, data format, smoothing
7 6 5 4 3 2 1 0
Measuring range channel 0…3
0 0 0 = Inactive
0 0 1 = 0..10V
0 1 0 = +/-10V
0 1 1 = 4..20 mA
1 0 0 = 0..20 mA
Diagnostic
0 = Report
1 = Do not report
Data format
0 = Byte sequence High/Low (Motorola)
1 = Byte sequence Low/High (Intel)
Smoothing
0 0 = None
0 1 = Weak
1 0 = Moderate
1 1 = Strong
reserviert

Fig. 32 Parameter byte 0, 3, 6, 9 of Cube20 AI4 U/I Art. No.: 56200

Bit assignment of parameter bytes 1…2, 4…5, 7…8, 10…11

Reserved

9.7.3 Explanation of Smoothing (Only Cube20 AI4 U/I Modules)

The analog signal can be prefiltered in the device, in order to reduce sensitivity to short-term jitter.

The measuring time per channel is 4.0 ms. The total cycle time is the result of the measuring time per channel + 4.0 ms. The diagram below illustrates the module behavior to a step response in an active channel.

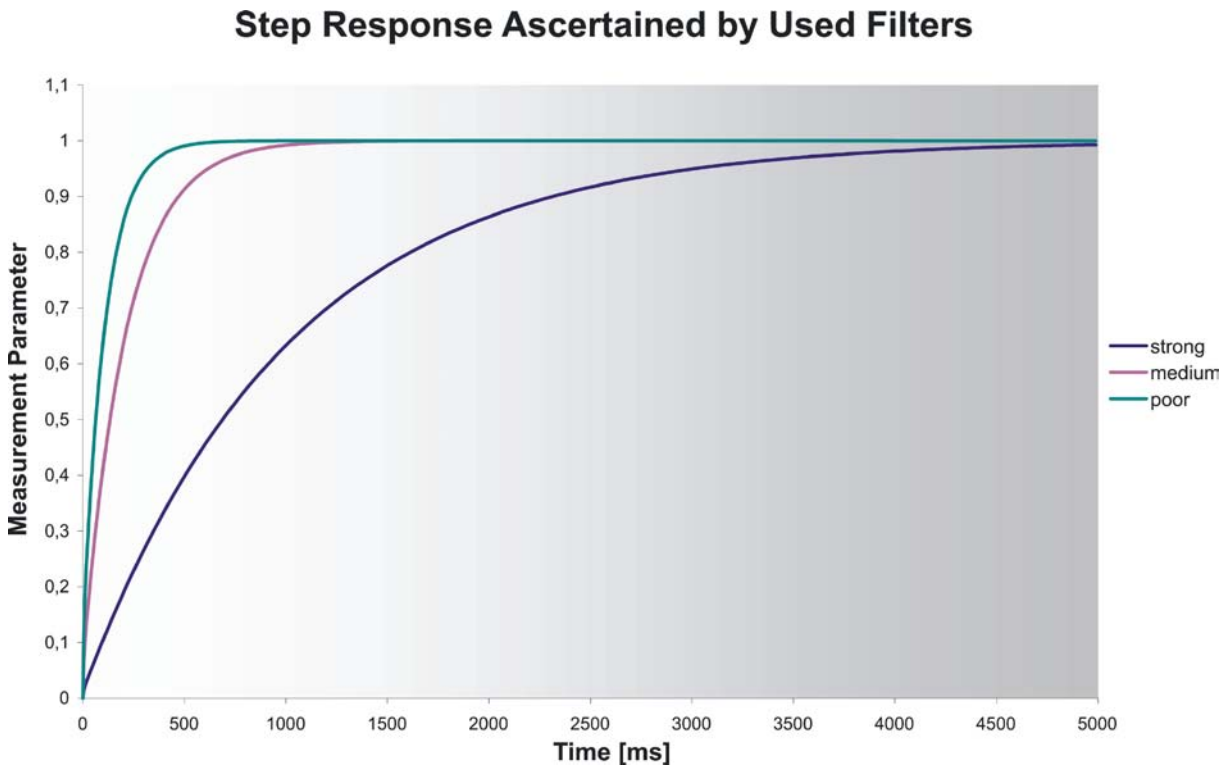


Fig. 33 Smoothing / Recorded step response with filters applied

9.7.4 Identification of Cube20 AI4 U/I Art.-No. 56201

Description	Art. No.	Process data		Identification
		Input	Output	
Cube20 AI4 U/I	56201	4 words	0 words	43_{hex} 43_{hex} DB_{hex} 89_{hex} 10_{hex}

Tab. 57 dentification of Cube20 AI4 U/I Art.-No. 56201

9.7.5 Number and Bit Assignment of Parameter Bytes Cube20 AI4 U/I Art. No.: 56201

Number of Parameter bytes: 16

Bit assignment of parameter bytes 0 (channel 0), 4 (channel 1), 8 (channel 2), 12 (channel 3)

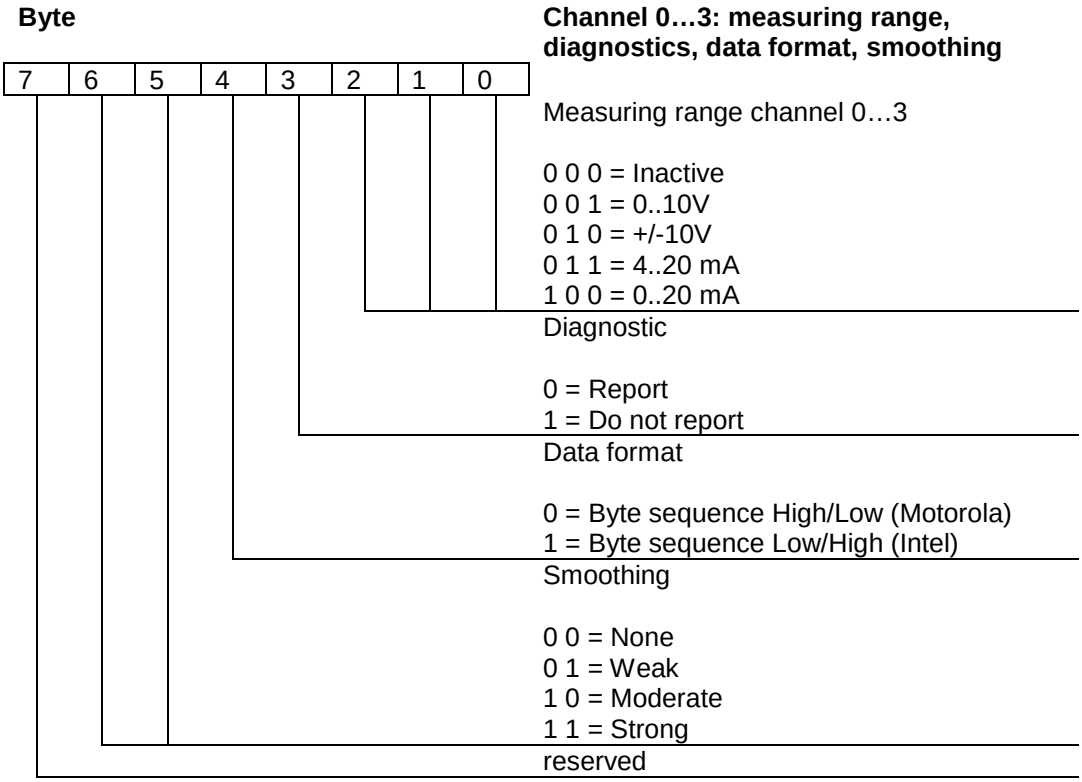

Byte
Channel 0…3: measuring range, diagnostics, data format, smoothing
7 6 5 4 3 2 1 0
Measuring range channel 0…3
0 0 0 = Inactive
0 0 1 = 0..10V
0 1 0 = +/-10V
0 1 1 = 4..20 mA
1 0 0 = 0..20 mA
Diagnostic
0 = Report
1 = Do not report
Data format
0 = Byte sequence High/Low (Motorola)
1 = Byte sequence Low/High (Intel)
Smoothing
0 0 = None
0 1 = Weak
1 0 = Moderate
1 1 = Strong
reserved

Fig. 34 Parameter byte 0, 4, 8, 12 of Cube20 AI4 U/I Art. No.: 56201

Bit assignment of parameter bytes 1, 5, 9, 13

reserved

For explanation of smoothing please see "Cube20 AI4 U/I Art.-No.: 56200".

Bit assignment of parameter bytes 2 and 3 (channel 0), 6 and 7 (channel 1), 10 and 11 (channel 2), 14 and 15 (channel 3)

Byte 2, 6, 10, 14 channel 0…3: Delta low Byte

Byte 3, 7, 11, 15 channel 0…3: Delta high Byte

Decimal	Byte	Signification
0 – 32767	0 – 0x7FFF	Delta

Tab. 58 Delta byte of Cube20 AI4 U/I Art.-No.: 56201

9.7.6 Delta Value (Only Cube20 AI4 U/I Art.-No.: 56201)

The delta value can be used to define the number of increments to increase or reduce the last measured value, in order to update the analog input value. This parameter can be used for reducing the bus load of the internal system connection.

Example: The last value measured was 1000. With a delta of 100, the next measurand will only be sent, if it is < 900 or > 1100.

9.7.7 Binary Representation of the Analog Data of Cube20 AI4 U/I Art.-No.: 56200 / 56201

Bit assignment of I/O – data in Intel format

I/O data								
Byte	7	6	5	4	3	2	1	0
Channel	3		2		1		0	

Bit	MSB							LSB	MSB							LSB
	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8
Byte	LOWBYTE								VZ	HIGHBYTE						
	7								6							

Tab. 59 Bit assignment analog I/O – data in Intel format

Bit assignment of I/O – data in Motorola format

I/O data								
Byte	7	6	5	4	3	2	1	0
Channel	3		2		1		0	

Bit	MSB							LSB	MSB							LSB
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Byte	VZ	HIGHBYTE							LOWBYTE							
	7								6							

Tab. 60 Bit assignment Analog I/O – data in Motorola format

9.7.8 Representation of analog values of Cube20 AI4 U/I Art.-No.: 56200 / 56201

Representation of analog values of input data 16 Bit with sign

Measuring range	Measuring value			Range	Diagnostic
0...10 V	decimal	hexadecimal	binary		
> 11.7589 V	32767	7FFF	0111 1111 1111 1111	Overshooting	Yes
11.7589 V	32511	7EFF	0111 1110 1111 1111	Overshooting	Yes
⋮	⋮	⋮	⋮	Overshooting	From threshold value
10.0004 V	27649	6C01	0110 1100 0000 0001	Overshooting	No
10 V	27648	6C00	0110 1100 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
5 V	13824	3600	0011 0110 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.0004 V	1	0001	0000 0000 0000 0001	Nominal range	No
0	0	0000	0000 0000 0000 0000	Nominal range	No
< 0	0	0000	0000 0000 0000 0000	Undershooting	From threshold value

Tab. 61 Analog values Cube20 AI4 U/I Art.-No.: 56200/56201 in the range of 0…10 V

Measuring range	Measuring value			Range	Diagnostic
-10...+10 V	decimal	hexadecimal	binary		
> 11.7589 V	32767	7FFF	0111 1111 1111 1111	Overshooting	Yes
11.7589 V	32511	7EFF	0111 1110 1111 1111	Overshooting	Yes
⋮	⋮	⋮	⋮	Overshooting	From threshold value
10.0004 V	27649	6C01	0110 1100 0000 0001	Overshooting	No
10 V	27648	6C00	0110 1100 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
5 V	13824	3600	0011 0110 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.0004 V	1	0001	0000 0000 0000 0001	Nominal range	No
0	0	0000	0000 0000 0000 0000	Nominal range	No
-0.0004 V	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-5 V	-13824	CA00	1100 1010 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-10 V	-27648	9400	1001 0100 0000 0000	Nominal range	No
-10.0004 V	-27649	93FF	1001 0011 1111 1111	Undershooting	No
⋮	⋮	⋮	⋮	Undershooting	From threshold value
-11.759 V	-32512	8100	1000 0001 0000 0000	Undershooting	Yes
< -11.759 V	-32768	8000	1000 0000 0000 0000	Undershooting	Yes

Tab. 62 Analog values Cube20 AI4 U/I Art.-No.: 56200/56201 in the range of -0…+10 V

Measuring range	Measuring value			Range	Diagnostic
< 0...20 mA	decimal	hexadecimal	decimal		
> 22.963 mA	32767	7FFF	0111 1111 1111 1111	Overshooting	Yes
22.963 mA	31744	7C00	0111 1110 1111 1111	Overshooting	Yes
⋮	⋮	⋮	⋮	Overshooting	From threshold value
20.0007 mA	27649	6C01	0110 1100 0000 0001	Overshooting	No
20 mA	27648	6C00	0110 1100 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
10 mA	13824	3600	0011 0110 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.0007 mA	1	0001	0000 0000 0000 0001	Nominal range	No
0	0	0000	0000 0000 0000 0000	Nominal range	No
< 0	0	0000	0000 0000 0000 0000	Undershooting	No

Tab. 63 Analog values Cube20 AI4 U/I Art.-No.: 56200/56201 in the range of 0…20 mA

Measuring range	Measuring value			Range	Diagnostic
< 4...20 mA	decimal	hexadecimal	binary		
> 22.8142 mA	32767	7FFF	0111 1111 1111 1111	Overshooting	Yes
22.8142 mA	32511	7EFF	0111 1100 0000 0000	Overshooting	Yes
⋮	⋮	⋮	⋮	Overshooting	From threshold value
20.0006 mA	27649	6C01	0110 1100 0000 0001	Overshooting	No
20 mA	27648	6C00	0110 1100 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
12 mA	13824	3600	0011 0110 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
4.0006 mA	1	0001	0000 0000 0000 0001	Nominal range	No
4 mA	0	0000	0000 0000 0000 0000	Nominal range	No
< 4 mA	0	0000	0000 0000 0000 0000	Undershooting	From threshold value

Tab. 64 Analog values Cube20 AI4 U/I Art.-No.: 56200/56201 in the range of 4…20 mA

9.8 Cube20 AO4 U/I Art. No.: 56220 / 56221

9.8.1 Identification of Cube20 AO4 U/I Art.-No. 56220

Description	Art. No.	Process data		Identification
		Input	Output	
Cube20 AO4 U/I	56220	0 words	4 words	83_{hex} 43_{hex} DB_{hex} $9C_{hex}$ $0C_{hex}$

Tab. 65 Identification of Cube20 AO4 U/I Art.-No. 56220

9.8.2 Number and Bit Assignment of Parameter Bytes Cube20 AO4 U/I Art. No.: 56220

Number of Parameter bytes: 12

Bit assignment of parameter bytes 0 (channel 0), 3 (channel 1), 6 (channel 2), 9 (channel 3)

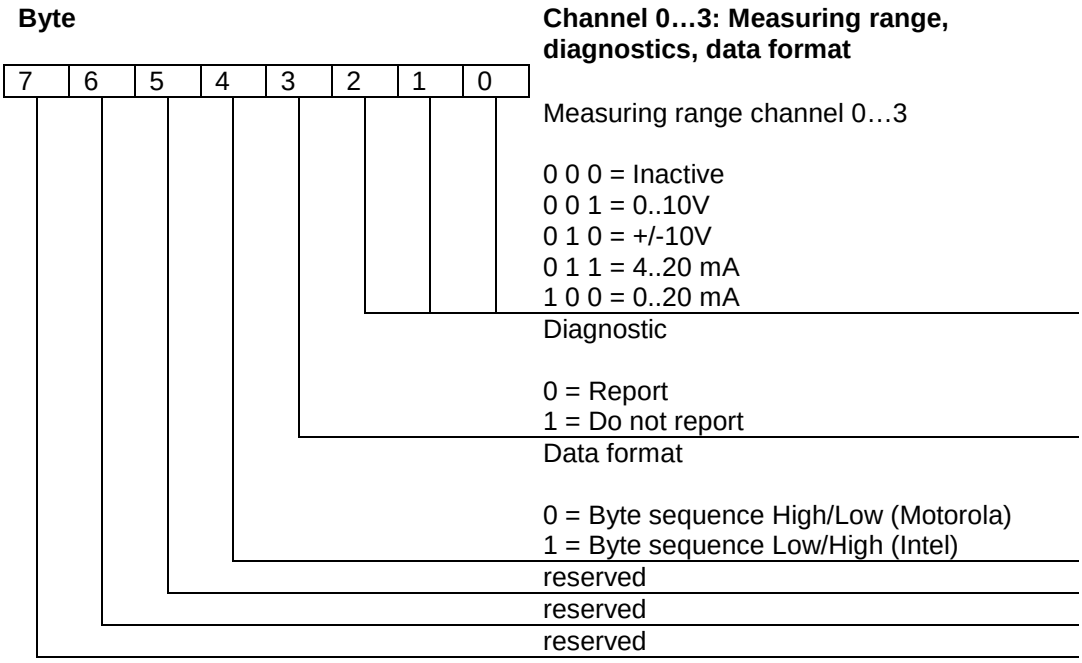

Byte
Channel 0…3: Measuring range, diagnostics, data format
7 6 5 4 3 2 1 0
Measuring range channel 0…3
0 0 0 = Inactive
0 0 1 = 0..10V
0 1 0 = +/-10V
0 1 1 = 4..20 mA
1 0 0 = 0..20 mA
Diagnostic
0 = Report
1 = Do not report
Data format
0 = Byte sequence High/Low (Motorola)
1 = Byte sequence Low/High (Intel)
reserved
reserved
reserved

Fig. 35 Parameter byte 0, 3, 6, 9 of Cube20 AO4 U/I Art. No.: 56220

Bit assignment of parameter bytes 1…2, 4…5, 7…8, 10…11

Reserved

9.8.3 Identification of Cube20 AO4 U/I Art. No. 56221

Description	Art. No.	Process data		Identification
		Input	Output	
Cube20 AO4 U/I	56221	0 words	4 words	0x82,0x43,0xDB,0x9D

Tab. 66 Identification of Cube20 AO4 U/I Art.-No. 56221

9.8.4 Number and Bit Assignment of Parameter Bytes Cube20 AO4 U/I Art. No.: 56221

Number of Parameter bytes: 16

Bit assignment of parameter bytes 0 (channel 0), 4 (channel 1), 8 (channel 2), 12 (channel 3)

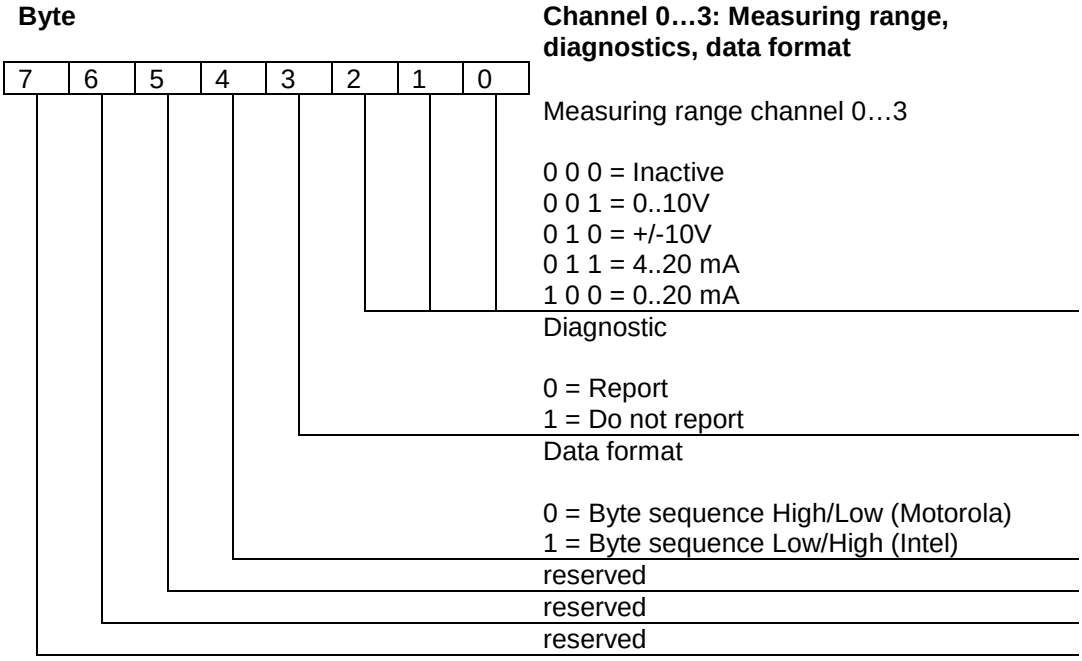

Byte
Channel 0…3: Measuring range, diagnostics, data format
7 6 5 4 3 2 1 0
Measuring range channel 0…3
0 0 0 = Inactive
0 0 1 = 0..10V
0 1 0 = +/-10V
0 1 1 = 4..20 mA
1 0 0 = 0..20 mA
Diagnostic
0 = Report
1 = Do not report
Data format
0 = Byte sequence High/Low (Motorola)
1 = Byte sequence Low/High (Intel)
reserved
reserved
reserved

Fig. 36 Parameter byte 0, 4, 8, 12 of Cube20 AO4 U/I Art. No.: 56221

Bit assignment of parameter bytes 1…3, 5…7, 9…11, 13…15,

Reserved

9.8.5 Binary Representation of the Analog Data of Cube20 AO4 U/I Art. No.: 56220 / 56221

Bit assignment of I/O – data in Intel format

I/O data								
Byte	7	6	5	4	3	2	1	0
Channel	3		2		1		0	

Bit	MSB							LSB	MSB							LSB
	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8
Byte	LOWBYTE								VZ	HIGHBYTE						
	7								6							

Tab. 67 Bit assignment analog I/O – data in Intel format

Bit assignment of I/O – data in Motorola format

I/O data								
Byte	7	6	5	4	3	2	1	0
Channel	3		2		1		0	

Bit	MSB							LSB	MSB							LSB
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Byte	VZ	HIGHBYTE							LOWBYTE							
	7								6							

Tab. 68 Bit assignment Analog I/O – data in Motorola format

9.8.6 Representation of Analog Values of Cube20 AO4 U/I Art. No.: 56220 / 56221

Representation of analog values of output data 16 Bit with sign

Output range	Measured value			Range	Diagnostic
0...10 V	decimal	hexadecimal	binary		
10 V	>= 27649	>= 6C01	>= 0110 1100 0000 0001	Overshooting	No
10 V	27648	6C00	0110 1100 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
5 V	13824	3600	0011 0110 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.0004 V	1	0001	0000 0000 0000 0001	Nominal range	No
0	0	0000	0000 0000 0000 0000	Nominal range	No
0	< 0	<0000	< 0000 0000 0000 0000	Undershooting	No

Tab. 69 Analog values Cube20 AO4 U/I Art.-No.: 56220 / 56221 in the range of 0...10 V

Measuring range	Measured value			Range	Diagnostic
-10...+10 V	decimal	hexadecimal	binary		
10 V	>= 27649	>= 6C01	>= 0110 1100 0000 0001	Overshooting	No
10 V	27648	6C00	0110 1100 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
5 V	13824	3600	0011 0110 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.0004 V	1	0001	0000 0000 0000 0001	Nominal range	No
0	0	0000	0000 0000 0000 0000	Nominal range	No
-0.0004 V	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-5 V	-13824	CA00	1100 1010 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-10 V	-27648	9400	1001 0100 0000 0000	Nominal range	No
-10 V	<= -27649	<= 93FF	<= 1001 0011 1111 1111	Undershooting	No

Tab. 70 Analog values Cube20 AO4 U/I Art.-No.: 56220 / 56221 in the range of -10...+10 V

Measuring range	Measured value			Range	Diagnostic
0...20 mA	decimal	hexadecimal	binary		
20 mA	>= 27649	>= 6C01	>= 0110 1100 0000 0001	Overshooting	No
20 mA	27648	6C00	0110 1100 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
10 mA	13824	3600	0011 0110 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.0007 mA	1	0001	0000 0000 0000 0001	Nominal range	No
0	0	0000	0000 0000 0000 0000	Nominal range	No

Tab. 71 Analogvalues Cube20 AO4 U/I Art.-No.: 56220 / 56221 in the range of 0...20 mA

Measuring range	Measured value			Range	Diagnostic
4...20 mA	dezimal	hexadezimal	binary		
20 mA	>= 27649	>= 6C01	>= 0110 1100 0000 0001	Overshooting	No
20 mA	27648	6C00	0110 1100 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
12 mA	13824	3600	0011 0110 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
4.0006 mA	1	0001	0000 0000 0000 0001	Nominal range	No
4 mA	0	0000	0000 0000 0000 0000	Nominal range	No

Tab. 72 Analog values Cube20 AO4 U/I Art.-No.: 56220 / 56221 in the range of 4...20 mA

9.9 Cube20 AI4 RTD Art. No.: 56230

9.9.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
Cube20 AI4 RTD	56230	4 words	0 words	43_{hex} 43_{hex} DB_{hex} $A6_{hex}$ 05_{hex}

Tab. 73 Identification of Cube20 AI4 RTD Art.-No. 56230

9.9.2 Number and Bit Assignment of Parameter Bytes

Number of Parameter bytes: 5

Bit assignment of parameter byte 0

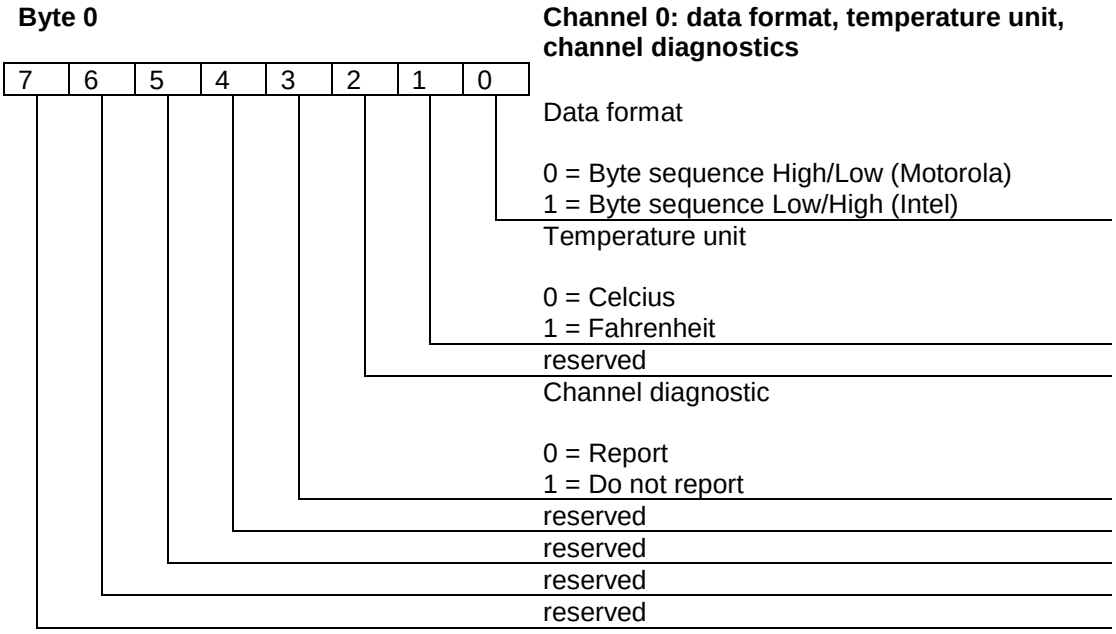


Fig. 37 Parameter byte 0 of Cube20 AI4 RTD Art. No.: 56230

Bit assignment of parameter bytes 1 (channel 0), 2 (channel 1), 3 (channel 2), 4 (channel 3)

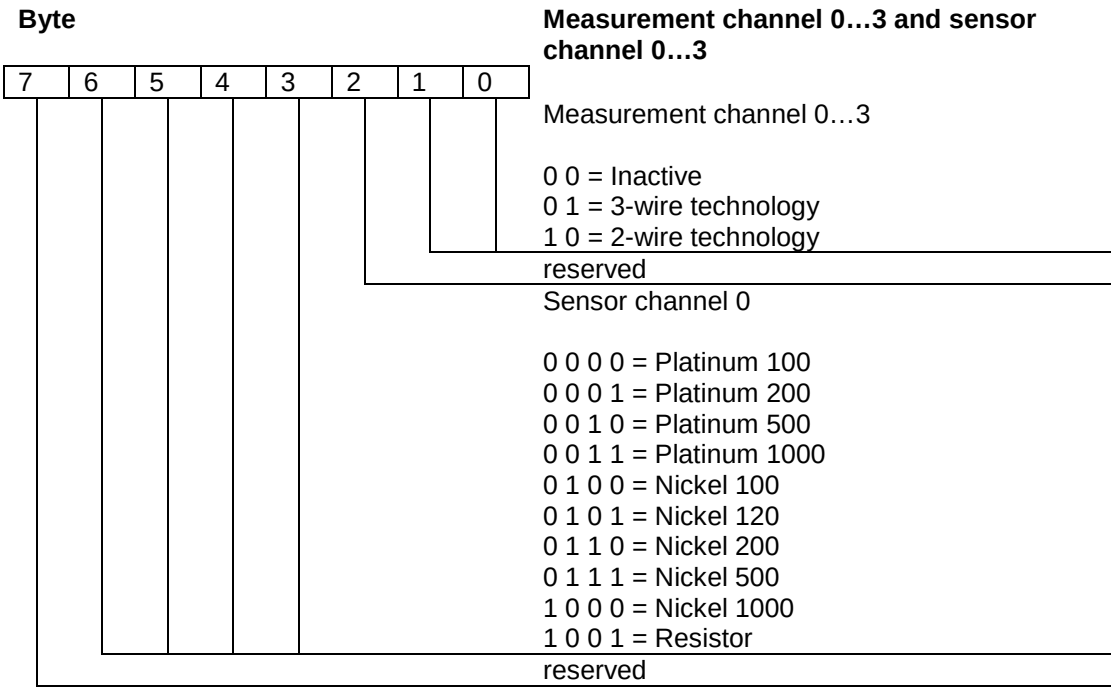

Byte
Measurement channel 0…3 and sensor channel 0…3
7 6 5 4 3 2 1 0
Measurement channel 0…3
0 0 = Inactive
0 1 = 3-wire technology
1 0 = 2-wire technology
reserved
Sensor channel 0
0 0 0 0 = Platinum 100
0 0 0 1 = Platinum 200
0 0 1 0 = Platinum 500
0 0 1 1 = Platinum 1000
0 1 0 0 = Nickel 100
0 1 0 1 = Nickel 120
0 1 1 0 = Nickel 200
0 1 1 1 = Nickel 500
1 0 0 0 = Nickel 1000
1 0 0 1 = Resistor
reserved

Fig. 38 Parameter byte 1, 2, 3, 4 of Cube20 AI4 RTD Art. No.: 56230

9.9.3 Binary Representation of Analog Data

Bit assignment of I/O – data in Intel format

I/O data								
Byte	7	6	5	4	3	2	1	0
Channel	3		2		1		0	

Bit	MSB							LSB	MSB							LSB
	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8
Byte	LOWBYTE								VZ	HIGHBYTE						
	7								6							

Tab. 74 Bit assignment analog I/O – Data in Intel format

Bit assignment of I/O – data in Motorola format

I/O data								
Byte	7	6	5	4	3	2	1	0
Channel	3		2		1		0	

Bit	MSB							LSB	MSB							LSB
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Byte	VZ	HIGHBYTE							LOWBYTE							
	7								6							

Tab. 75 Bit assignment Analog I/O – Data in Motorola format

9.9.4 Representation of Analog Values of Cube20 AI4 RTD Art. No.: 56230

Representation of analog values of input data 16 Bit with sign

The data is represented in steps of 1/10 Ohm for the resistance range, in steps of 1/10 degree Celsius or 1/10 degree Fahrenheit for the temperature ranges.

Analog values for the unit "degree Celsius"

Measuring range	Measuring value			Range	Diagnostic
Pt 100 / Pt 200 / Pt 500 / Pt 1000	decimal	hexadecimal	binary		
> 850 °C	8500	2134	0010 0001 0011 0100	Overshooting	From threshold value
850 °C	8500	2134	0010 0001 0011 0100	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °C	0	0001	0000 0000 0000 0001	Nominal range	No
0 °C	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °C	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-200 °C	-2000	F830	1111 1000 0011 0000	Nominal range	No
< -200 °C	-2000	F830	1111 1000 0011 0000	Undershooting	From threshold value

Tab. 76 Analog values Cube20 AI4 RTD Art.-No.: 56230 in the range of platinum / °C

Measuring range	Measured value			Range	Diagnostic
Ni 100 / Ni 120 / Ni 200 / Ni 500 / Ni 1000	dezimal	hexadezimal	binary		
> 250 °C	2500	09C4	0000 1001 1100 0100	Overshooting	From threshold value
250 °C	2500	09C4	0000 1001 1100 0100	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °C	0	0000	0000 0000 0000 0001	Nominal range	No
0 °C	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °C	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-60 °C	-600	FDA8	1111 1101 1010 1000	Nominal range	No
< -60 °C	-600	FDA8	1111 1101 1010 1000	Undershooting	From threshold value

Tab. 77 Analog values Cube20 AI4 RTD Art.-No.: 56230 in the range of Nickel / °C

Analog values for the unit "degree Fahrenheit"

Measuring range	Measured value			Range	Diagnostic
Pt 100 / Pt 200 / Pt 500 / Pt 1000	decimal	hexadecimal	binary		
> 1562 °F	15620	3D04	0011 1101 0000 0100	Overshooting	From threshold value
1562 °F	15620	3D04	0011 1101 0000 0100	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °F	1	0001	0000 0000 0000 0001	Nominal range	No
0 °F	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °F	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-328 °F	-3280	F330	1111 0011 0011 0000	Nominal range	No
< -328 °F	-3280	F330	1111 0011 0011 0000	Undershooting	From threshold value

Tab. 78 Analog values Cube20 AI4 RTD Art.-No.: 56230/ in the range of platinum / °F

Measuring range	Measured value			Range	Diagnostic
Ni 100 / Ni 120 / Ni 200 / Ni 500 / Ni 1000	decimal	hexadecimal	binary		
> 482 °F	4820	12D4	0001 0010 1101 0100	Overshooting	From threshold value
482 °F	4820	12D4	0001 0010 1101 0100	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °F	1	0001	0000 0000 0000 0001	Nominal range	No
0 °F	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °F	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-76 °F	-760	FD08	1111 1101 0000 1000	Nominal range	No
< -76 °F	-760	FD08	1111 1101 0000 1000	Undershooting	From threshold value

Tab. 79 Analog values Cube20 AI4 RTD Art.-No.: 56230/ in the range of nickel / °F

Measuring range	Measured value			Range	Diagnostic
Resistor	decimal	hexadecimal	binary		
> 3000 □	30000	7530	0111 0101 0011 0000	Overshooting	From threshold value
3000 □	30000	7530	0111 0101 0011 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0,1 □	1	0001	0000 0000 0000 0001	Nominal range	No
0	0	0000	0000 0000 0000 0000	Nominal range	No

Tab. 80 Analog values Cube20 AI4 RTD Art.-No.: 56230 in the range of resistance

9.10 Cube20 AI4 TH Art. No.: 56240

9.10.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
Cube20 AI4 TH	56240	4 words	0 words	43_{hex} 43_{hex} DB_{hex} $B0_{hex}$ 05_{hex}

Tab. 81 Identification of Cube20 AI4 TH Art.-No. 56240

9.10.2 Number and Bit Assignment of Parameter Bytes

Number of Parameter bytes: 5

Bit assignment of parameter byte 0

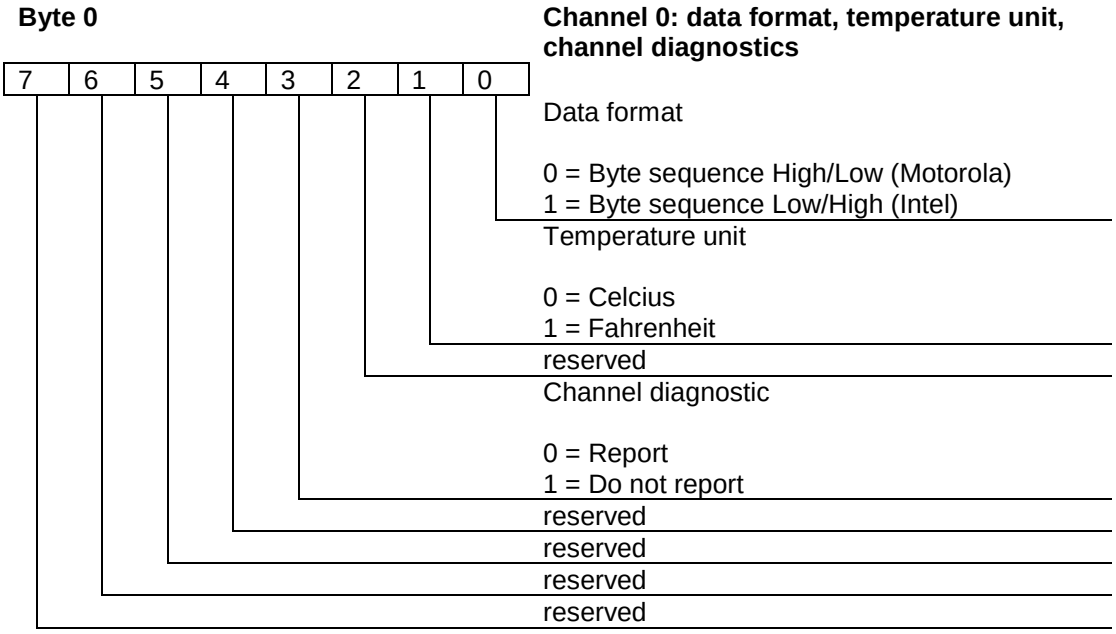


Fig. 39 Parameter byte 0 of Cube20 AI4 TH Art. No.: 56240

Bit assignment of parameter bytes 1 (channel 0), 2 (channel 1), 3 (channel 2), 4 (channel 3)

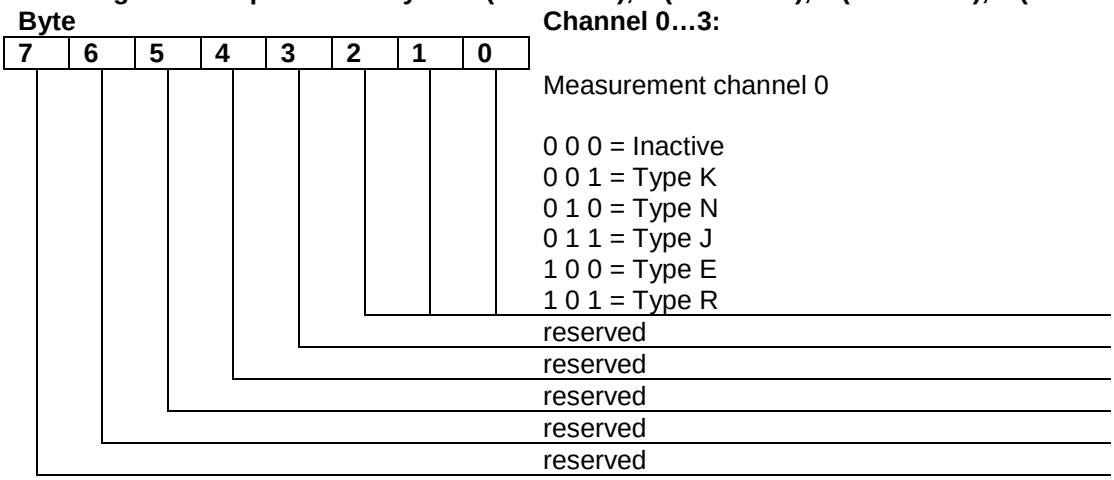


Fig. 40 Parameter byte 1, 2, 3, 4 of Cube20 A/4 TH Art. No. 56240

9.10.3 Binary Representation of Analog Data

Bit assignment of I/O – data in Intel format

I/O data								
Byte	7	6	5	4	3	2	1	0
Channel	3		2		1		0	

Bit	MSB							LSB	MSB							LSB
	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8
Byte	LOWBYTE								VZ	HIGHBYTE						
	7								6							

Tab. 82 Bit Assignment Analog I/O – Data in Intel format

Bit assignment of I/O – data in Motorola format

I/O data								
Byte	7	6	5	4	3	2	1	0
Channel	3		2		1		0	

Bit	MSB							LSB	MSB							LSB
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Byte	VZ	HIGHBYTE							LOWBYTE							
	7								6							

Tab. 83 Bit Assignment Analog I/O – Data in Motorola format

9.10.4 Representation of Analog Values of Cube20 AI4 TH Art. No.: 56240

Representation of analog values of input data 16 Bit with sign

The data are represented in steps of 1/10 degree Celsius or 1/10 degree Fahrenheit.

Analog values for the unit "degree Celsius"

Measuring range	Measured value			Range	Diagnostic
Type K	decimal	hexadecimal	binary		
> 1372 °C	13720	3598	0011 0101 1001 1000	Overshooting	From threshold value
1372 °C	13720	3598	0011 0101 1001 1000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °C	0	0001	0000 0000 0000 0001	Nominal range	No
0 °C	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °C	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-200 °C	-2000	F830	1111 1000 0011 0000	Nominal range	No
< -200 °C	-2000	F830	1111 1000 0011 0000	Undershooting	From threshold value

Tab. 84 Analog values Cube20 AI4 TH Art.-No.: 56240 in the range of Type K / °C

Measuring range	Measured value			Range	Diagnostic
Type N	decimal	hexadecimal	binary		
> 1300 °C	13000	32C8	0011 0010 1100 1000	Overshooting	From threshold value
1300 °C	13000	32C8	0011 0010 1100 1000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °C	0	0001	0000 0000 0000 0001	Nominal range	No
0 °C	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °C	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-200 °C	-2000	F830	1111 1000 0011 0000	Nominal range	No
< -200 °C	-2000	F830	1111 1000 0011 0000	Undershooting	From threshold value

Tab. 85 Analog values Cube20 AI4 TH Art.-No.: 56240 in the range of Type N / °C

Measuring range	Measured value			Range	Diagnostic
Type J	decimal	hexadezimal	binary		
> 1200 °C	12000	2EE0	0010 1110 1110 0000	Overshooting	From threshold value
1200 °C	12000	2EE0	0010 1110 1110 0000	Nominal range	No

Measuring range	Measured value			Range	Diagnostic
Type J	decimal	hexadezimal	binary		
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °C	0	0001	0000 0000 0000 0001	Nominal range	No
0 °C	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °C	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-200 °C	-2000	F830	1111 1000 0011 0000	Nominal range	No
< -200 °C	-2000	F830	1111 1000 0011 0000	Undershooting	From threshold value

Tab. 86 Analog values Cube20 AI4 TH Art.-No.: 56240 in the range of Type J / °C

Measuring range	Measured value			Range	Diagnostic
Type E	decimal	hexadecimal	binary		
> 1000 °C	10000	2710	0010 0111 0001 0000	Overshooting	From threshold value
1000 °C	10000	2710	0010 0111 0001 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °C	0	0001	0000 0000 0000 0001	Nominal range	No
0 °C	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °C	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-200 °C	-2000	F830	1111 1000 0011 0000	Nominal range	No
< -200 °C	-2000	F830	1111 1000 0011 0000	Undershooting	From threshold value

Tab. 87 Analog values Cube20 AI4 TH Art.-No.: 56240 in the range of Type E / °C

Measuring range	Measured value			Range	Diagnostic
Type R	decimal	hexadezimal	binary		
> 1768 °C	17680	4510	0100 0101 0001 0000	Overshooting	From threshold value
1768 °C	17680	4510	0100 0101 0001 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °C	0	0001	0000 0000 0000 0001	Nominal range	No
0 °C	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °C	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-50 °C	-500	FE0C	1111 1110 0000 1100	Nominal range	No
< -50 °C	-500	FE0C	1111 1110 0000 1100	Undershooting	From threshold value

Tab. 88 Analog values Cube20 AI4 TH Art.-No.: 56240 in the range of Type R / °C

Analog values for the unit "degree Fahrenheit"

Measuring range	Measured value			Range	Diagnostic
Type K	decimal	hexadecimal	binary		
> 2501.6 °F	25016	61B8	0011 0000 11011 1000	Overshooting	From threshold value
2501.6 °F	25016	61B8	0011 0000 11011 1000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °F	0	0001	0000 0000 0000 0001	Nominal range	No
0 °F	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °F	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-328 °F	-3280	F330	1111 0011 0011 0000	Nominal range	No
< -328 °F	-3280	F330	1111 0011 0011 0000	Undershooting	From threshold value

Tab. 89 Analog values Cube20 AI4 TH Art.-No.: 56240 in the range of Type K / °F

Measuring range	Measured value			Range	Diagnostic
Type N	decimal	hexadecimal	binary		
> 2372 °F	23720	5CA8	0101 1100 1010 1000	Overshooting	From threshold value
2372 °F	23720	5CA8	0101 1100 1010 1000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °F	0	0001	0000 0000 0000 0001	Nominal range	No
0 °F	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °F	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-328 °F	-3280	F330	1111 0011 0011 0000	Nominal range	No
< -328 °F	-3280	F330	1111 0011 0011 0000	Undershooting	From threshold value

Tab. 90 Analog values Cube20 AI4 TH Art.-No.: 56240 in the range of Type N / °F

Measuring range	Measured value			Range	Diagnostic
Type J	decimal	hexadecimal	binary		
> 2192 °F	21920	55A0	0101 0101 1010 0000	Overshooting	From threshold value
2192 °F	21920	55A0	0101 0101 1010 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No

Measuring range	Measured value			Range	Diagnostic
Type J	decimal	hexadecimal	binary		
0.1 °F	0	0001	0000 0000 0000 0001	Nominal range	No
0 °F	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °F	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-328 °F	-3280	F330	1111 0011 0011 0000	Nominal range	No
< -328 °F	-3280	F330	1111 0011 0011 0000	Undershooting	From threshold value

Tab. 91 Analog values Cube20 AI4 TH Art.-No.: 56240 in the range of Type J / °F

Measuring range	Measured value			Range	Diagnostic
Type E	decimal	hexadecimal	binary		
> 1832 °F	18320	4790	0100 0111 1001 0000	Overshooting	From threshold value
1832 °F	18320	4790	0100 0111 1001 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °F	0	0001	0000 0000 0000 0001	Nominal range	No
0 °F	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °F	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-328 °F	-3280	F330	1111 0011 0011 0000	Nominal range	No
< -328 °F	-3280	F330	1111 0011 0011 0000	Undershooting	From threshold value

Tab. 92 Analog values Cube20 AI4 TH Art.-No.: 56240 in the range of Type E / °F

Measuring range	Measured value			Range	Diagnostic
Type R	decimal	hexadecimal	binary		
> 3214.4 °F	32144	7D90	0111 1101 1001 0000	Overshooting	From threshold value
3214.4 °F	32144	7D90	0111 1101 1001 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °F	0	0001	0000 0000 0000 0001	Nominal range	No
0 °F	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °F	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-58 °F	-580	FDBC	1111 1101 1011 1100	Nominal range	No
< -58 °F	-580	FDBC	1111 1101 1011 1100	Undershooting	From threshold value

Tab. 93 Analog values Cube20 AI4 TH Art.-No.: 56240 in the range of Type R / °F

10 Cube67 Digital I/O Modules

In the GSD file Version 1, the default setting of Pin 2 “Diagnostic input”. In the GSD file Version 2 the default setting was changed to “input with N/O function”.

Reserved bytes must be written with zero. When using the GSD, file this will be done automatically.

No. of I/O modules	Running time bus node	Running time module	Total running time
1	1-2	2-4	3 – 6 ms
4	1-4	2-4	3 – 8 ms
8	1-5	2-4	3 – 9 ms
12	2-6	2-4	4 – 10 ms
16	2-10	2-4	4 – 14 ms

Tab. 94 Signal delay of the digital inputs and outputs

10.1 DIO16 C 8xM12 – Art.Nr. 56600

10.1.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
DIO 16 C 8xM12	56600	2 bytes	2 bytes	C2hex 01hex 01hex DDhex 18hex
DI16 C 8xM12	56600	2 bytes	-	42hex 01hex DDhex 1Ahex
DO16 C 8xM12	56600	-	2 bytes	82 hex 01hex DDhex 1Chex

Tab. 95 Identification

10.1.2 Bit Assignment I/O - Data

Input Data (IDM)								
Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Tab. 96 Input data (IDM)

Output data (ODM)								
Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Tab. 97 Output data (ODM)

10.1.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions fo Pin 2 and Pin 4 are not identical.

10.1.3.1 Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	Output

Tab. 98 Function Pin 2

10.1.3.2 Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

Tab. 99 Function Pin 4

10.1.3.3 Parameterbytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	Function socket 0..3 Pin 2 (Channel 10..13)
3	Function socket 4..7 Pin 2 (Channel 14..17)
4	reserved
5	reserved
6	reserved
7	reserved

Tab. 100 Parameterbytes

10.1.3.4 Bit Assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

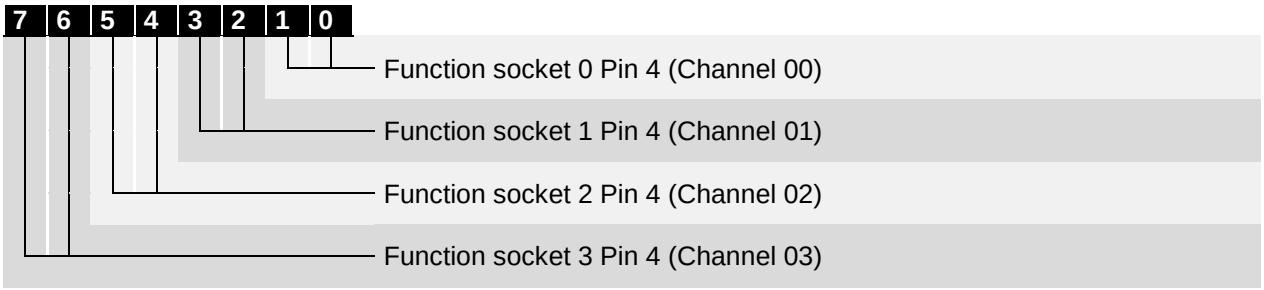

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Fig. 41 Bit assignment of byte0

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

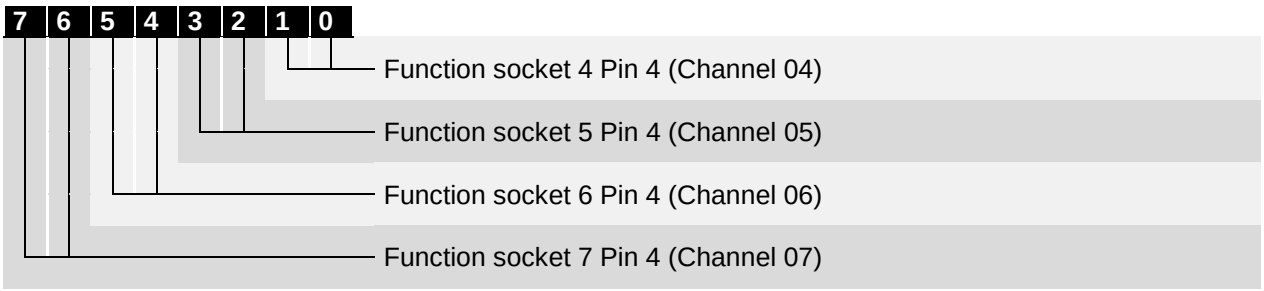

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Fig. 42 Bit assignment of byte1

Byte 2 Function socket 0..3 Pin 2 (Channel 10..13)

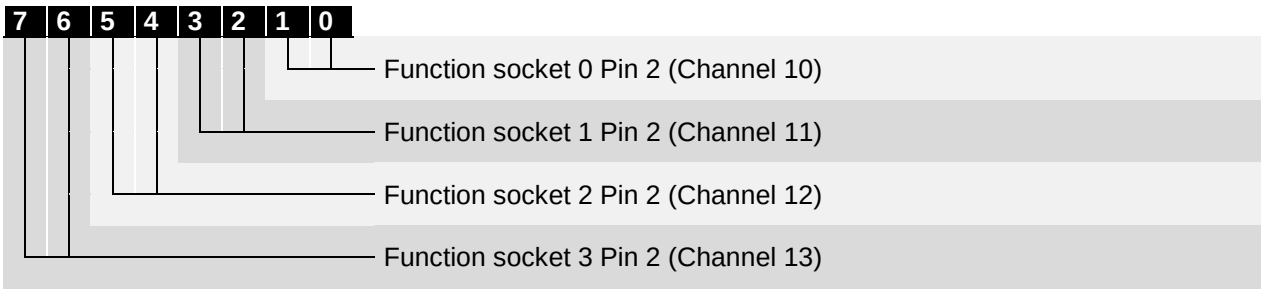

7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Fig. 43 Bit assignment of byte2

Byte 3 Function socket 4..7 Pin 2 (Channel 14..17)

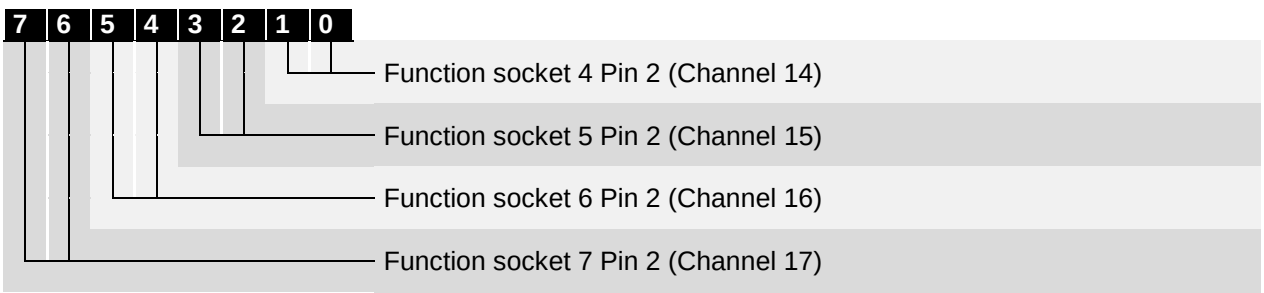

7 6 5 4 3 2 1 0
Function socket 4 Pin 2 (Channel 14)
Function socket 5 Pin 2 (Channel 15)
Function socket 6 Pin 2 (Channel 16)
Function socket 7 Pin 2 (Channel 17)

Fig. 44 Bit assignment of byte3

10.2 DIO16 E 8xM12 – Art.Nr. 56601xx

10.2.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
DIO16 E 8xM12	56601	2 Byte	2 Byte	$C3_{hex}$ 01_{hex} 01_{hex} DD_{hex} 19_{hex} 08_{hex}
DI16 E 8xM12	56601	2 Byte	-	43_{hex} 01_{hex} DD_{hex} $1B_{hex}$ 08_{hex}
DO16 E 8xM12	56601	-	2 Byte	83_{hex} 01_{hex} 27_{hex} 10_{hex} 08_{hex}
DIO16 E 8xM12 VA	5660150	2 Byte	2 Byte	$C3_{hex}$ 01_{hex} 01_{hex} DD_{hex} 19_{hex} 08_{hex}
DI16 E 8xM12 VA	5660150	2 Byte	-	43_{hex} 01_{hex} DD_{hex} $1B_{hex}$ 08_{hex}
DO16 E 8xM12 VA	5660150	-	2 Byte	83_{hex} 01_{hex} 27_{hex} 10_{hex} 08_{hex}
DIO16 E 8xM12 VA	5660151	2 Byte	2 Byte	$C3_{hex}$ 01_{hex} 01_{hex} DD_{hex} 19_{hex} 08_{hex}
DI16 E 8xM12 VA	5660151	2 Byte	-	43_{hex} 01_{hex} DD_{hex} $1B_{hex}$ 08_{hex}
DO16 E 8xM12 VA	5660151	-	2 Byte	83_{hex} 01_{hex} 27_{hex} 10_{hex} 08_{hex}

Tab. 101 Identification

10.2.2 Bit Assignment I/O - Data

10.2.2.1 Input Data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Tab. 102 Input data (IDM)

10.2.2.2 Output Data ODM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Tab. 103 Output data (ODM)

10.2.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 are not identical.

10.2.3.1 Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	Output

Tab. 104 Function pin 2

10.2.3.2 Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

Tab. 105 Function pin 4

10.2.3.3 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	Function socket 0..3 Pin 2 (Channel 10..13)
3	Function socket 4..7 Pin 2 (Channel 14..17)
4	reserved
5	reserved
6	reserved
7	reserved

Tab. 106 Parameter bytes

10.2.3.4 Bit assignment of parameter bytes

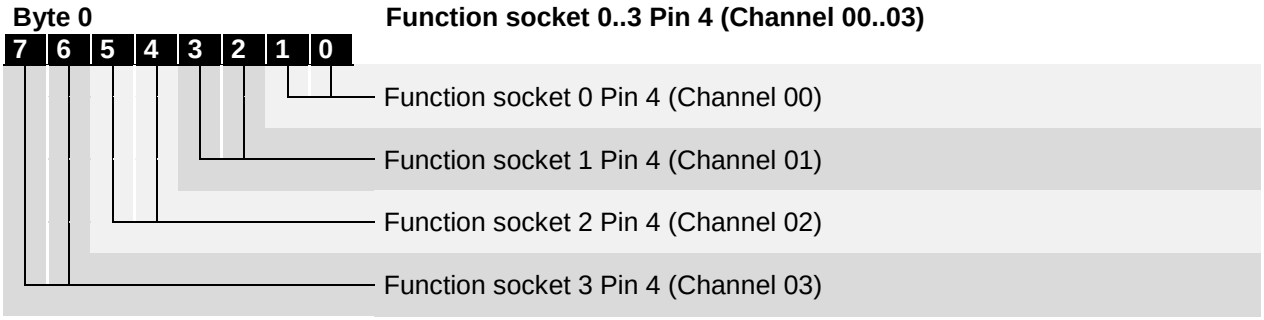

Byte 0
Function socket 0..3 Pin 4 (Channel 00..03)
7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Fig. 45 Bit assignment of byte 0

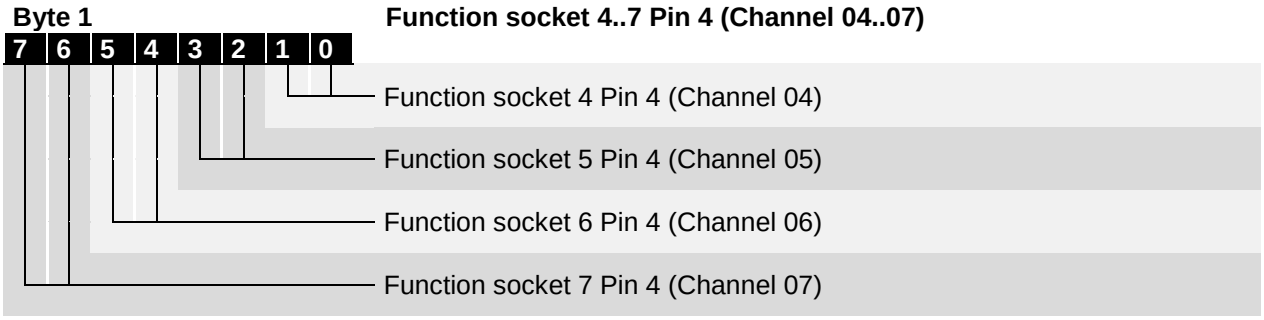

Byte 1
Function socket 4..7 Pin 4 (Channel 04..07)
7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Fig. 46 Bit assignment of byte 1

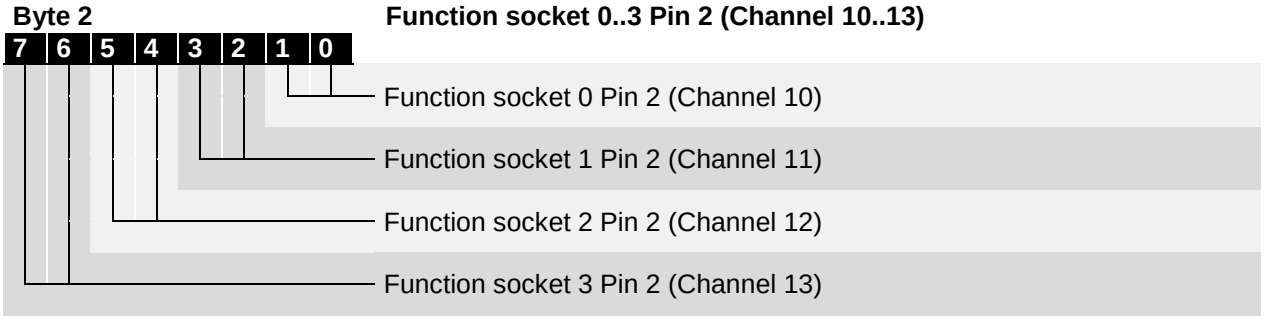

Byte 2
Function socket 0..3 Pin 2 (Channel 10..13)
7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Fig. 47 Bit assignment of byte 2

Byte 3
Function socket 4..7 Pin 2 (Channel 14..17)
7 6 5 4 3 2 1 0
Function socket 4 Pin 2 (Channel 14)
Function socket 5 Pin 2 (Channel 15)
Function socket 6 Pin 2 (Channel 16)
Function socket 7 Pin 2 (Channel 17)

Fig. 48 Bit assignment of byte 3

10.3 DI16 C 8xM12 – Art.Nr. 56602

10.3.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
DI16 C 8xM12	56602	2 bytes	-	43_{hex} 01_{hex} DD_{hex} $1A_{hex}$ 08_{hex}

Tab. 107 Identification

10.3.2 Bit Assignment I/O - Data

10.3.2.1 Input Data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Tab. 108 Input data (IDM)

10.3.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 are not identical.

10.3.3.1 Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	reserved

Tab. 109 Function pin 2

10.3.3.2 Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

Tab. 110 Function pin 4

10.3.3.3 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	Function socket 0..3 Pin 2 (Channel 10..13)
3	Function socket 4..7 Pin 2 (Channel 14..17)
4	reserved
5	reserved
6	reserved
7	reserved

Tab. 111 Parameter bytes

10.3.3.4 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

Fig. 49 Bit assignment of byte 0

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

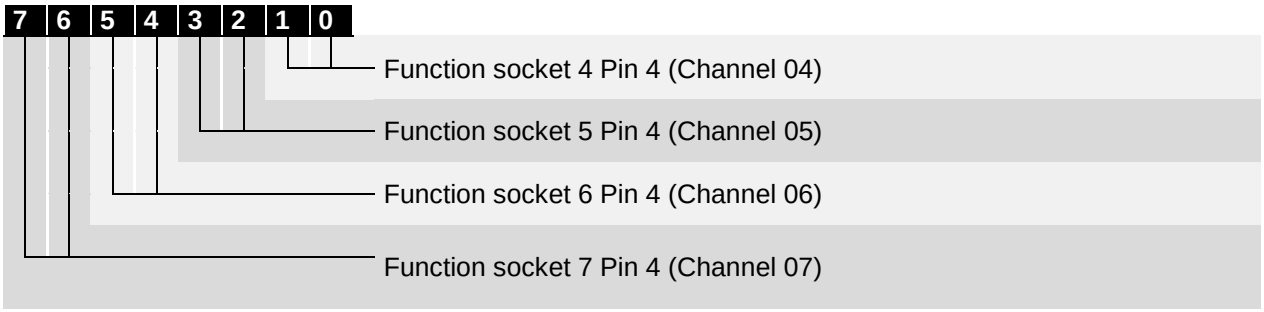

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Fig. 50 Bit assignment of byte 1

Byte 2 Function socket 0..3 Pin 2 (Channel 10..13)

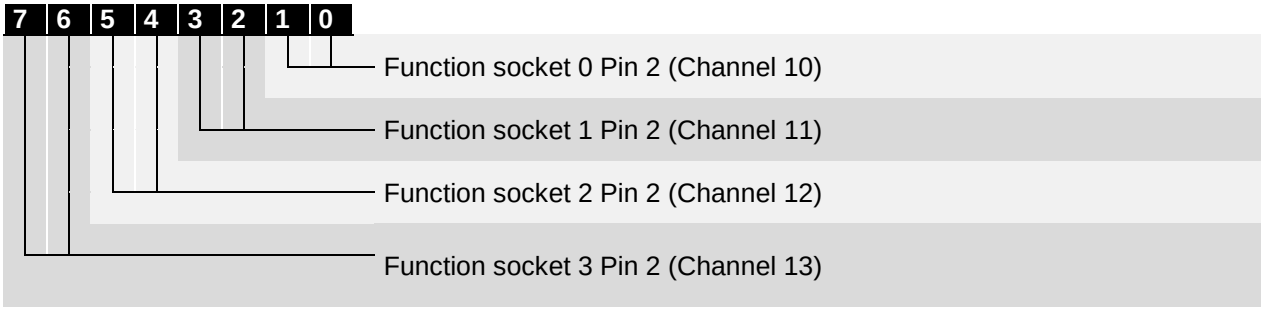

7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Fig. 51 Bit assignment of byte 2

Byte 3 Function socket 4..7 Pin 2 (Channel 14..17)

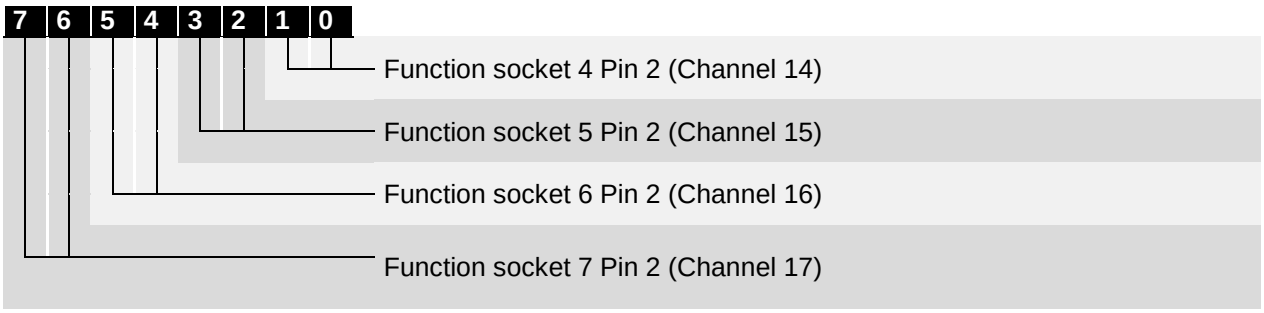

7 6 5 4 3 2 1 0
Function socket 4 Pin 2 (Channel 14)
Function socket 5 Pin 2 (Channel 15)
Function socket 6 Pin 2 (Channel 16)
Function socket 7 Pin 2 (Channel 17)

Fig. 52 Bit assignment of byte 1

10.4 DI16 E 8xM12 – Art.Nr. 56603xx

10.4.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
DI16 E 8xM12	56603	2 bytes	-	43_{hex} 01_{hex} DD_{hex} $1B_{hex}$ 08_{hex}
DI16 E 8xM12 VA	5660350	2 Byte	-	43_{hex} 01_{hex} DD_{hex} $1B_{hex}$ 08_{hex}

Tab. 112 Identification

10.4.2 Bit Assignment I/O - Data

10.4.2.1 Input Data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Tab. 113 Input data (IDM)

10.4.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 are not identical.

10.4.3.1 Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	reserved

Tab. 114 Function pin 2

10.4.3.2 Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

Tab. 115 Function pin 4

10.4.3.3 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	Function socket 0..3 Pin 2 (Channel 10..13)
3	Function socket 4..7 Pin 2 (Channel 14..17)
4	reserved
5	reserved
6	reserved
7	reserved

Tab. 116 Parameter bytes

10.4.3.4 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

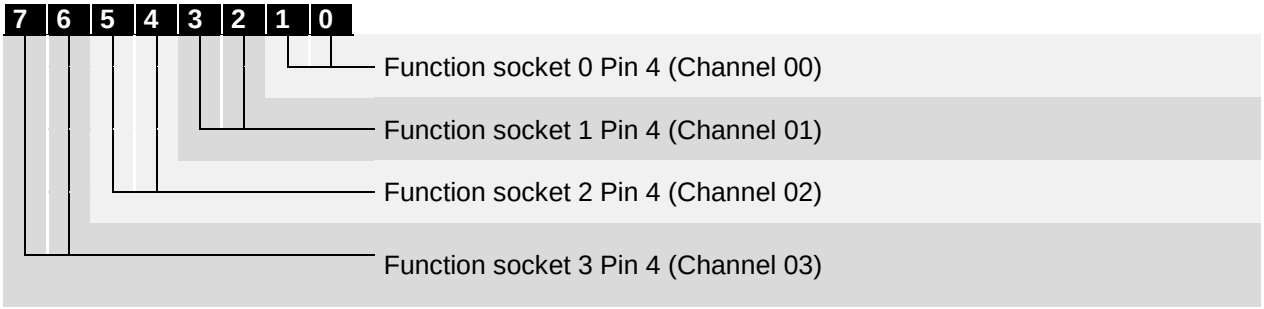

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Fig. 53 Bit assignment of byte 0

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

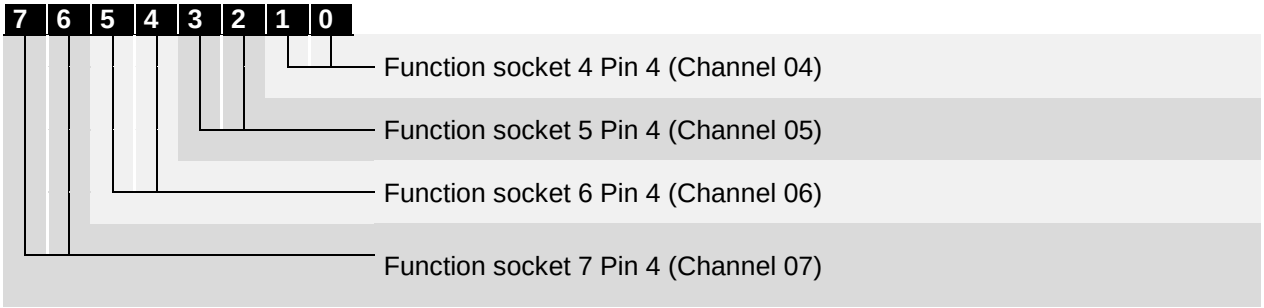

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Fig. 54 Bit assignment of byte 1

Byte 2 Function socket 0..3 Pin 2 (Channel 10..13)

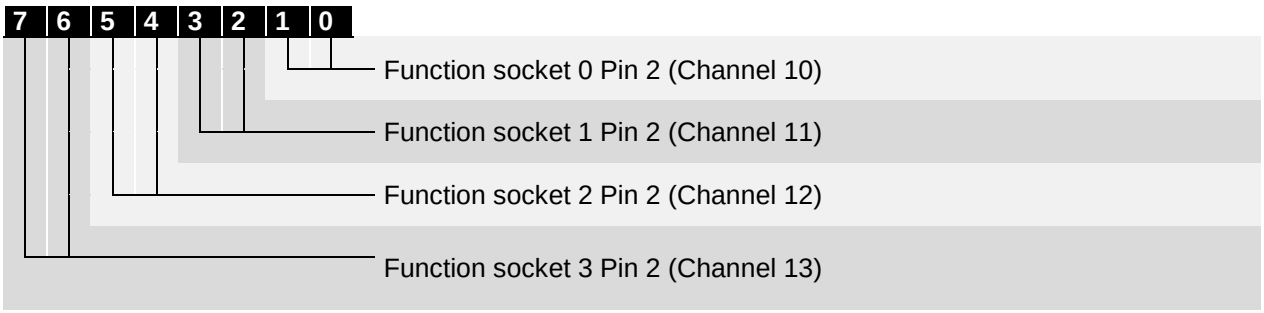

7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Fig. 55 Bit assignment of byte 2

Byte 3 Function socket 4..7 Pin 2 (Channel 14..17)

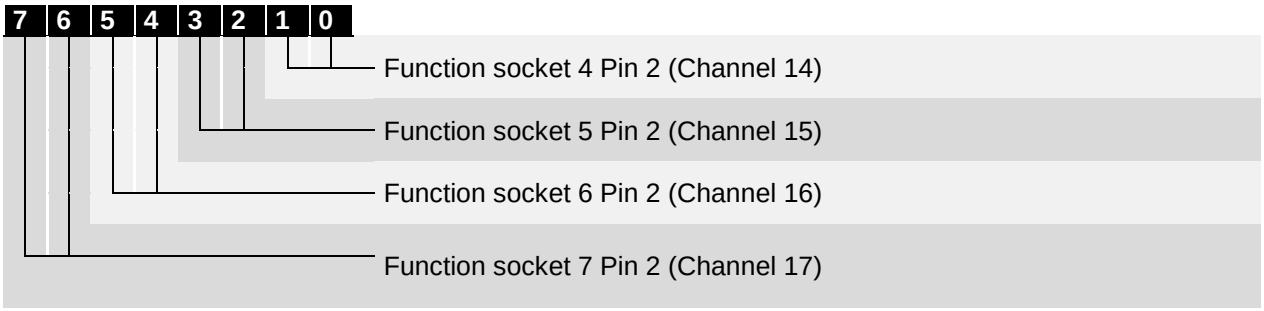

7 6 5 4 3 2 1 0
Function socket 4 Pin 2 (Channel 14)
Function socket 5 Pin 2 (Channel 15)
Function socket 6 Pin 2 (Channel 16)
Function socket 7 Pin 2 (Channel 17)

Fig. 56 Bit assignment of byte 3

10.5 DO12 E 6xM12 K3 – Art.Nr. 56605

10.5.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
DO12 E 6xM12 K3	56605	-	2 bytes	83_{hex} 01_{hex} DD_{hex} $1D_{hex}$ 04_{hex}

Tab. 117 Identification

10.5.2 Bit Assignment I/O - Data

10.5.2.1 Output Data ODM

Byte 0 (Channel 00 to 05)								
Bit	7	6	5	4	3	2	1	0
Channel	reserved	reserved	05	04	03	02	01	00
Byte 1 (Channel 10 to 15)								
Bit	7	6	5	4	3	2	1	0
Channel	reserved	reserved	15	14	13	12	11	10

Tab. 118 Output data (ODM)

10.5.3 Parameter bytes

Byte	Signification
4	reserved
5	reserved
6	reserved
7	reserved

Tab. 119 Parameter bytes

10.6 DI16 E 8xM12 NPN – Art.Nr. 56606

10.6.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
DI16 E 8xM12 NPN	56606	2 bytes	-	43_{hex} 01_{hex} DD_{hex} $1E_{hex}$ 08_{hex}

Tab. 120 Identification

10.6.2 Bit Assignment I/O - Data

10.6.2.1 Input Data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Tab. 121 Input data (IDM)

10.6.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 are not identical.

10.6.3.1 Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

Tab. 122 Function Pin 2

10.6.3.2 Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

Tab. 123 Function Pin 4

10.6.4 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	Function socket 0..3 Pin 2 (Channel 10..13)
3	Function socket 4..7 Pin 2 (Channel 14..17)
4	reserved
5	reserved
6	reserved
7	reserved

Tab. 124 Parameter bytes

10.6.4.1 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

Fig. 57 Bit assignment of byte 0

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

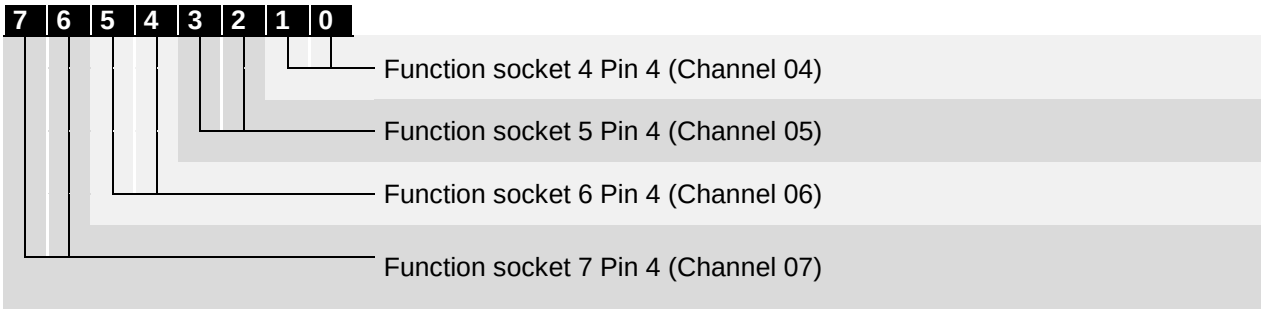

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Fig. 58 Bit assignment of byte 1

Byte 2 Function socket 0..3 Pin 2 (Channel 10..13)

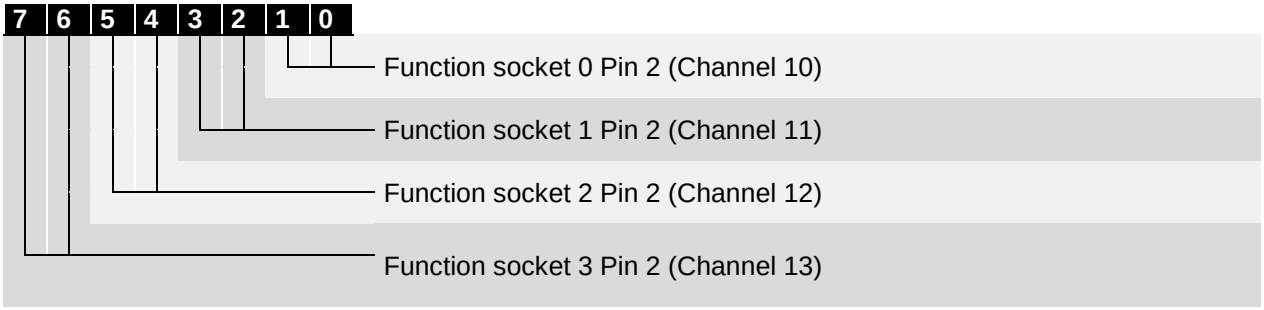

7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Fig. 59 Bit assignment of byte 2

Byte 3 Function socket 4..7 Pin 2 (Channel 14..17)

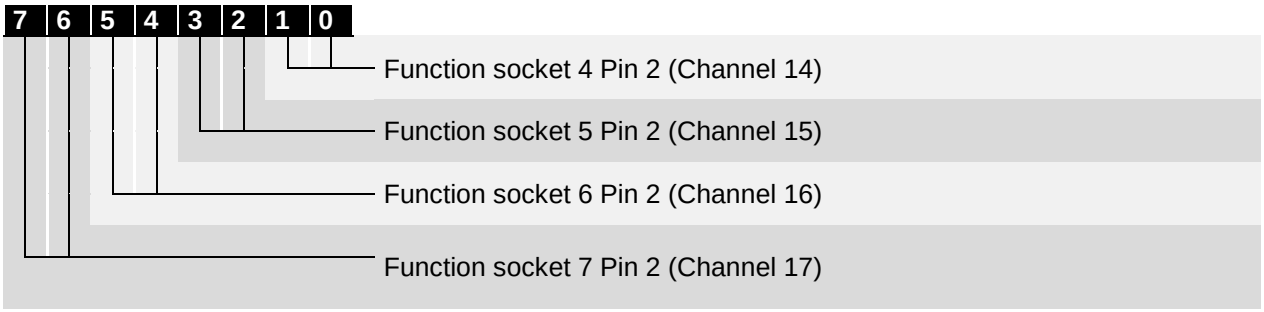

7 6 5 4 3 2 1 0
Function socket 4 Pin 2 (Channel 14)
Function socket 5 Pin 2 (Channel 15)
Function socket 6 Pin 2 (Channel 16)
Function socket 7 Pin 2 (Channel 17)

Fig. 60 Bit assignment of byte 3

10.7 DIO8 C 4xM12 – Art.No. 56610

10.7.1 Identification

Bezeichnung	Art.No.	Process data		Identification
		Input	Output	
DIO8 C 4xM12	56610	2 bytes	2 bytes	$C3_{hex}$ 01_{hex} 01_{hex} DD_{hex} 22_{hex} 04_{hex}
DI8 C 4xM12	56610	2 bytes	-	43_{hex} 01_{hex} DD_{hex} 24_{hex} 04_{hex}
DO8 C 4xM12	56610	-	2 bytes	83_{hex} 01_{hex} DD_{hex} 26_{hex} 04_{hex}

Tab. 125 Identification

10.7.2 Bit Assignment I/O - Data

10.7.2.1 Input Data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	13	12	11	10

Tab. 126 Input data (IDM)

10.7.2.2 Output Data ODM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	13	12	11	10

Tab. 127 Output data (ODM)

10.7.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

10.7.3.1 Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	Output

Tab. 128 Function Pin 2

10.7.3.2 Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

Tab. 129 Function Pin 4

10.7.3.3 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 0..3 Pin 2 (Channel 10..13)
2	reserved
3	reserved

Tab. 130 Parameter bytes

10.7.3.4 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

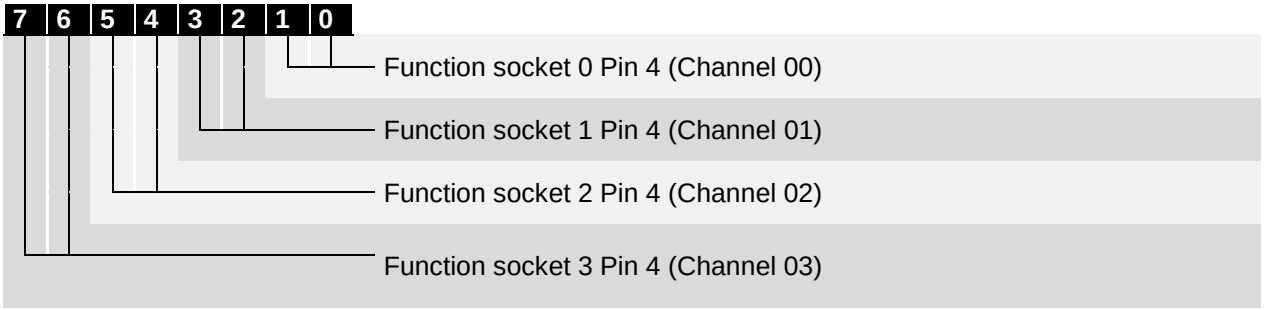

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Fig. 61 Bit assignment of byte 0

Byte 1 Function socket 0..3 Pin 2 (Channel 10..13)

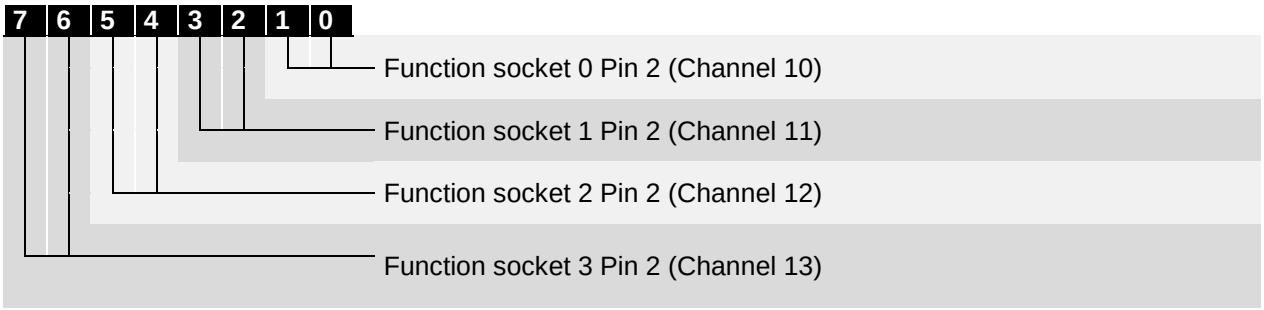

7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Fig. 62 Bit assignment of byte 1

10.8 DIO8 E 4xM12 – Art.No. 56611xx

10.8.1 Identification

Bezeichnung	Art.No.	Process data		Identification
		Input	Output	
DIO8 E 4xM12	56611	2 bytes	2 bytes	$C3_{hex}$ 01_{hex} 01_{hex} DD_{hex} 23_{hex} 04_{hex}
DI8 E 4xM12	56611	2 bytes	-	43_{hex} 01_{hex} DD_{hex} 25_{hex} 04_{hex}
DO8 E 4xM12	56611	-	2 bytes	83_{hex} 01_{hex} DD_{hex} 27_{hex} 04_{hex}
DIO8 E 4xM12 VA	5661150	2 bytes	2 bytes	$C3_{hex}$ 01_{hex} 01_{hex} DD_{hex} 23_{hex} 04_{hex}
DI8 E 4xM12 VA	5661150	2 bytes	-	43_{hex} 01_{hex} DD_{hex} 25_{hex} 04_{hex}
DO8 E 4xM12 VA	5661150	-	2 bytes	83_{hex} 01_{hex} DD_{hex} 27_{hex} 04_{hex}

Tab. 131 Identification

10.8.2 Bit Assignment I/O - Data

10.8.2.1 Input data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	13	12	11	10

Tab. 132 Input data (IDM)

10.8.2.2 Output Data ODM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	13	12	11	10

Tab. 133 Output data (ODM)

10.8.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

10.8.3.1 Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	Output

Tab. 134 Function Pin 2

10.8.3.2 Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

Tab. 135 Function Pin 4

10.8.3.3 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 0..3 Pin 2 (Channel 10..13)
2	reserved
3	reserved

Tab. 136 Parameter bytes

10.8.3.4 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

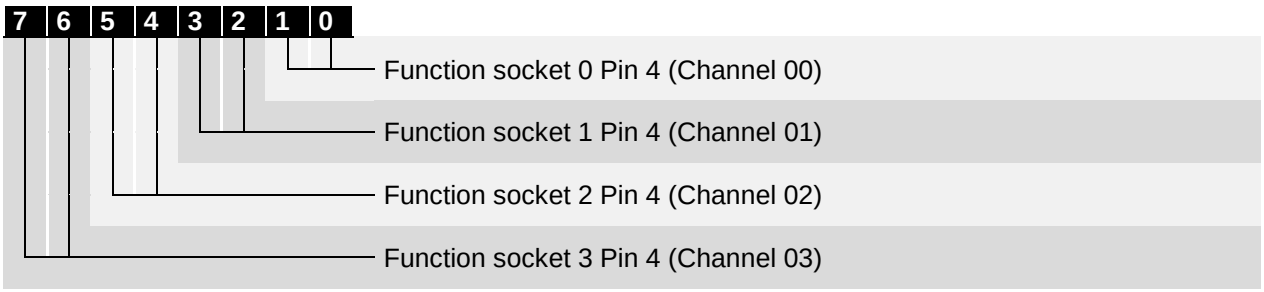

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Fig. 63 Bit assignment of byte 0

Byte 1 Function socket 0..3 Pin 2 (Channel 10..13)

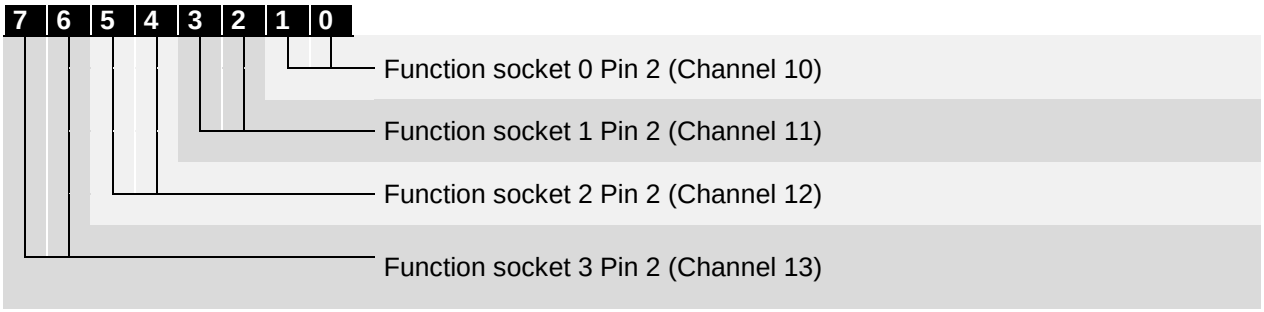

7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Fig. 64 Bit assignment of byte 1

10.9 DI8 C 4xM12 – Art.No. 56612

10.9.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DI8 C 4xM12	56612	2 bytes	-	43_{hex} 01_{hex} DD_{hex} 24_{hex} 04_{hex}

Tab. 137 Identification

10.9.2 Bit Assignment I/O - Data

10.9.2.1 Input Data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	13	12	11	10

Tab. 138 Input data (IDM)

10.9.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

10.9.3.1 Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	reserved

Tab. 139 Function Pin 2

10.9.3.2 Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

Tab. 140 Function Pin 4

10.9.3.3 Parameterbytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 0..3 Pin 2 (Channel 10..13)
2	reserved
3	reserved

Tab. 141 Parameter bytes

10.9.3.4 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

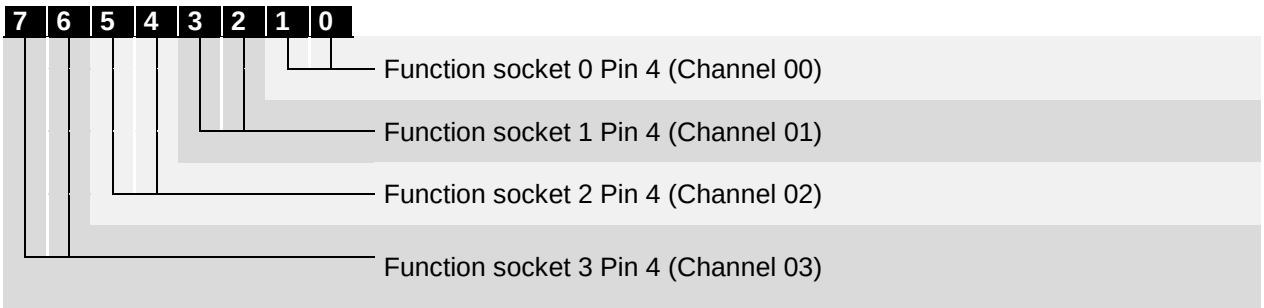


Fig. 65 Bit assignment of byte 0

Byte 1 Function socket 0..3 Pin 2 (Channel 10..13)

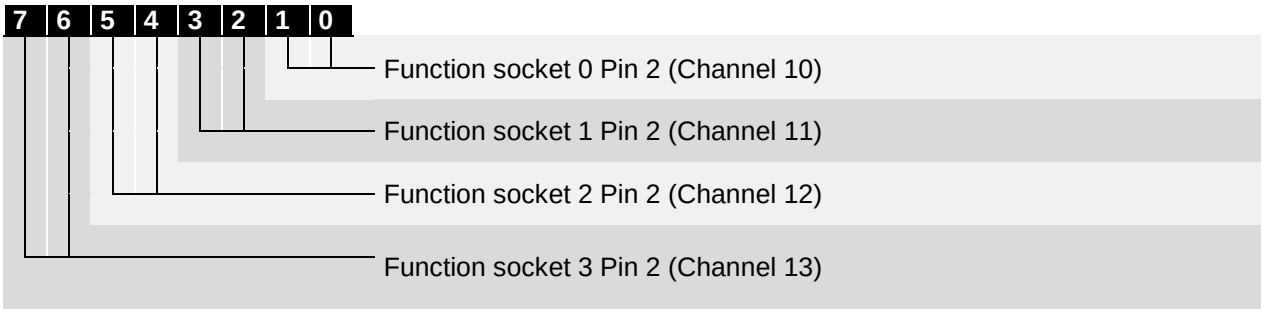


Fig. 66 Bit assignment of byte 1

10.10 DI8 E 4xM12 – Art.No. 56613

10.10.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DI8 E 4xM12	56613	2 bytes	-	43_{hex} 01_{hex} DD_{hex} 25_{hex} 04_{hex}

Tab. 142 Identification

10.10.2 Bit Assignment I/O - Data

10.10.2.1 Input Data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	13	12	11	10

Tab. 143 Input data (IDM)

10.10.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

10.10.3.1 Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	reserved

Tab. 144 Function Pin 2

10.10.3.2 Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

Tab. 145 Function Pin 4

10.10.3.3 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 0..3 Pin 2 (Channel 10..13)
2	reserved
3	reserved

Tab. 146 Parameter bytes

10.10.3.4 Bit assignment of parameter bytes

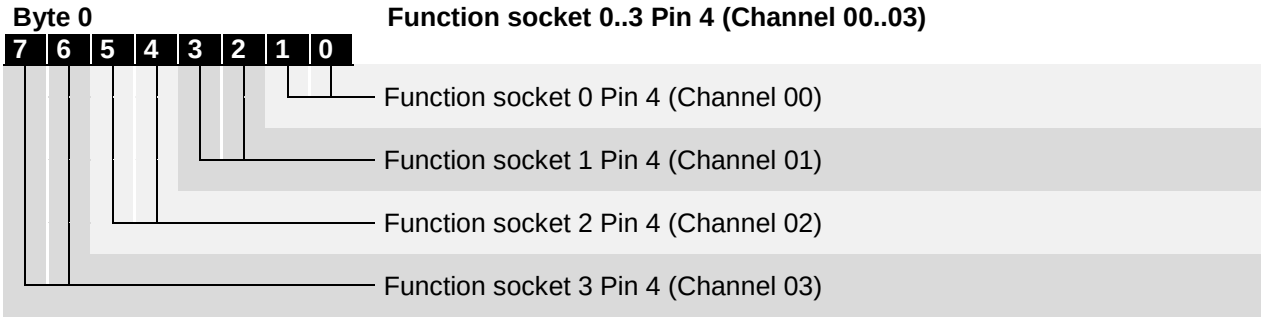

Byte 0
Function socket 0..3 Pin 4 (Channel 00..03)
7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Fig. 67 Bit assignment of byte 0

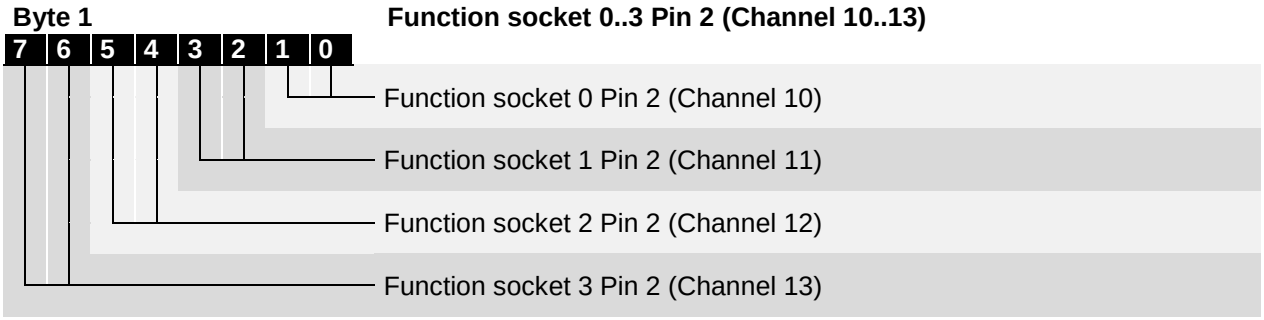

Byte 1
Function socket 0..3 Pin 2 (Channel 10..13)
7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Fig. 68 Bit assignment of byte 1

10.11 DI8 E 4xM12 NPN – Art.No. 56616

10.11.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DI8 E 4xM12 NPN	56616	2 bytes	-	43_{hex} 01_{hex} DD_{hex} 28_{hex} 04_{hex}

Tab. 147 Identification

10.11.2 Bit Assignment I/O - Data

10.11.2.1 Input Data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	13	12	11	10

Tab. 148 Input data (IDM)

10.11.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

10.11.3.1 Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

Tab. 149 Function Pin 2

10.11.3.2 Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

Tab. 150 Function Pin 4

10.11.3.3 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 0..3 Pin 2 (Channel 10..13)
2	reserved
3	reserved

Tab. 151 Parameter bytes

10.11.3.4 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

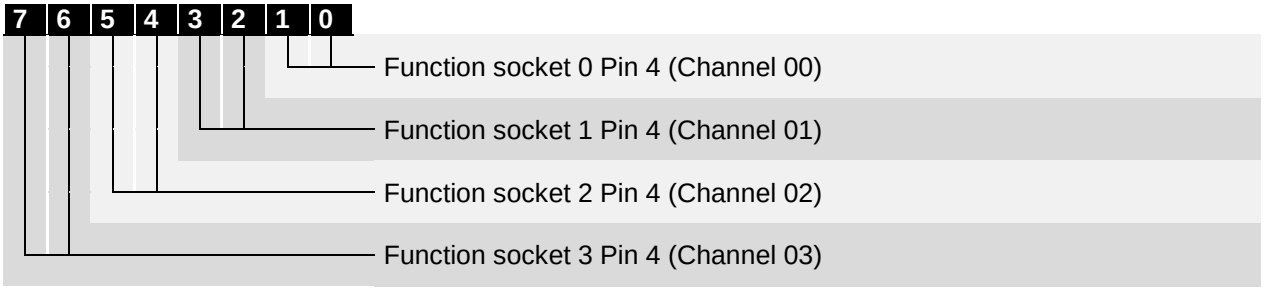

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Fig. 69 Bit assignment of byte 0

Byte 1 Function socket 0..3 Pin 2 (Channel 10..13)

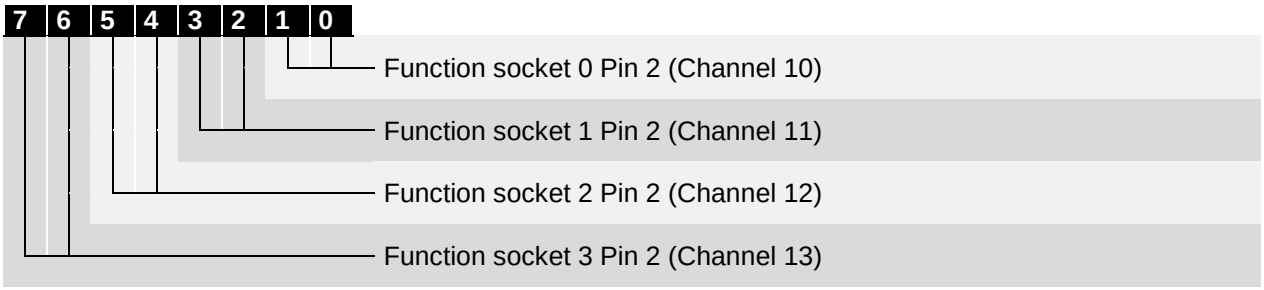

7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Fig. 70 Bit assignment of byte 1

10.12 DIO8 C 8xM8 – Art.No. 56620

10.12.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DIO8 C 8xM8	56620	1 Byte	1 Byte	$C3_{hex}$ 00_{hex} 00_{hex} DD_{hex} $2C_{hex}$ 04_{hex}
DI8 C 8xM8	56620	1 Byte	-	43_{hex} 00_{hex} DD_{hex} $2E_{hex}$ 04_{hex}
DO8 C 8xM8	56620	-	1 Byte	83_{hex} 00_{hex} DD_{hex} 30_{hex} 04_{hex}

Tab. 152 Identification

10.12.2 Bit Assignment I/O - Data

10.12.2.1 Input Data IDM

Byte 0 (Pin 4 of M8 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

Tab. 153 Input data (IDM)

10.12.2.2 Output Data ODM

Byte 0 (Pin 4 of M8 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

Tab. 154 Output data (ODM)

10.12.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

10.12.3.1 Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

Tab. 155 Function Pin 4

10.12.3.2 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	reserved
3	reserved

Tab. 156 Parameter bytes

10.12.3.3 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

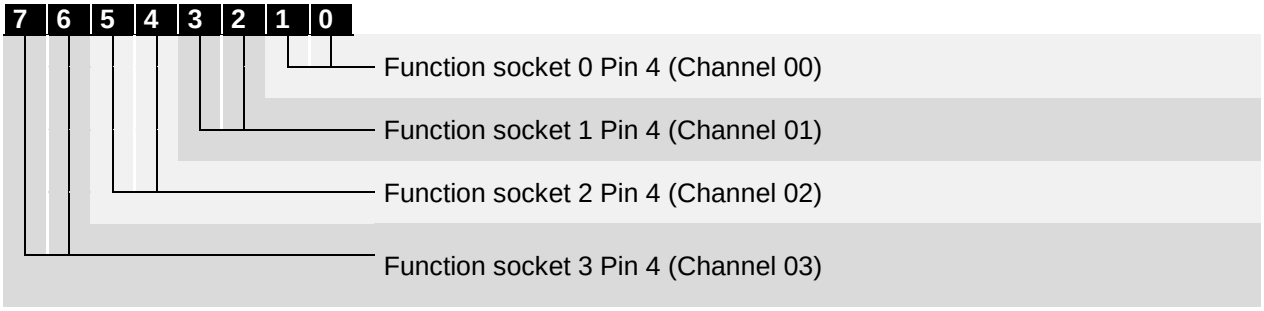


Fig. 71 Bit assignment of byte 0

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

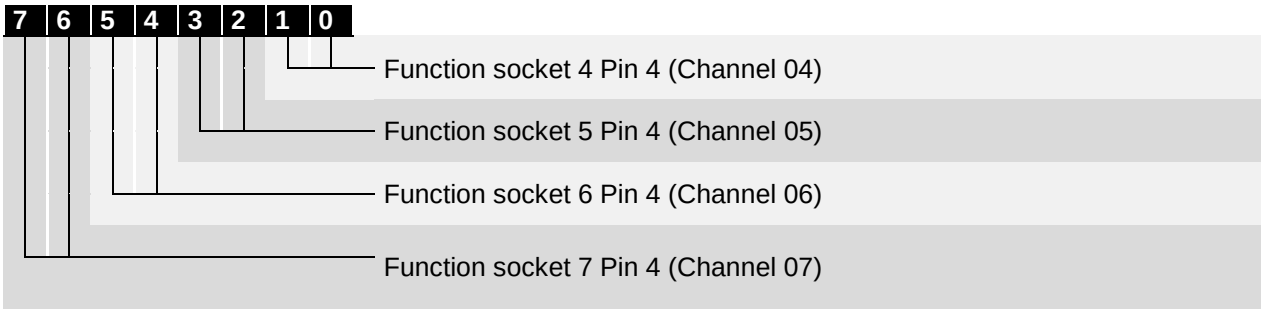

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Fig. 72 Bit assignment of byte 1

10.13 DIO8 E 8xM8 – ArtNr. 56621xx

10.13.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DIO8 E 8xM8	56621	1 Byte	1 Byte	$C3_{hex}$ 00_{hex} 00_{hex} DD_{hex} $2D_{hex}$ 04_{hex}
DI8 E 8xM8	56621	1 Byte	-	43_{hex} 00_{hex} DD_{hex} $2F_{hex}$ 04_{hex}
DO8 E 8xM8	56621	-	1 Byte	83_{hex} 00_{hex} DD_{he}x 31_{hex} 04_{hex}
DIO8 E 8xM8 VA	5662150	1 Byte	1 Byte	$C3_{hex}$ 00_{hex} 00_{hex} DD_{hex} $2D_{hex}$ 04_{hex}
DI8 E 8xM8 VA	5662150	1 Byte	-	43_{hex} 00_{hex} DD_{hex} $2F_{hex}$ 04_{hex}
DO8 E 8xM8 VA	5662150	-	1 Byte	83_{hex} 00_{hex} DD_{he}x 31_{hex} 04_{hex}

Tab. 157 Identification

10.13.2 Bit Assignment I/O - Data

10.13.2.1 Input Data IDM

Byte 0 (Pin 4 of M8 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

Tab. 158 Input data (IDM)

10.13.2.2 Output Data ODM

Byte 0 (Pin 4 of M8 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

Tab. 159 Output data (ODM)

10.13.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

10.13.3.1 Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

Tab. 160 Function Pin 4

10.13.3.2 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	reserved
3	reserved

Tab. 161 Parameter bytes

10.13.3.3 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

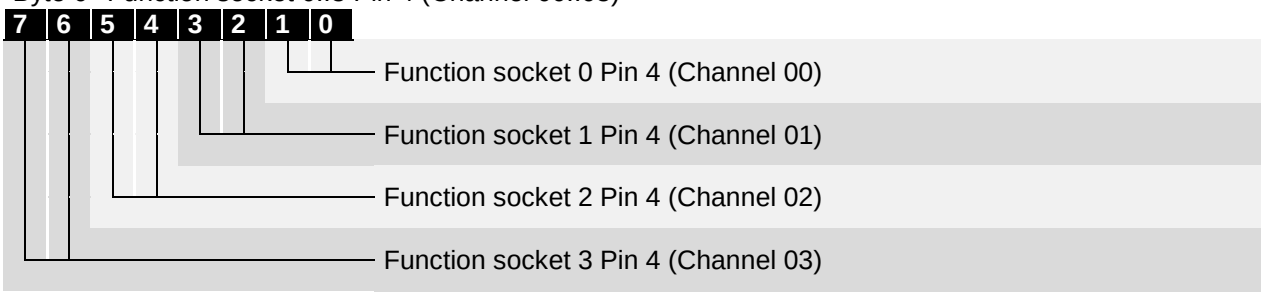

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Fig. 73 Bit assignment of byte 0

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

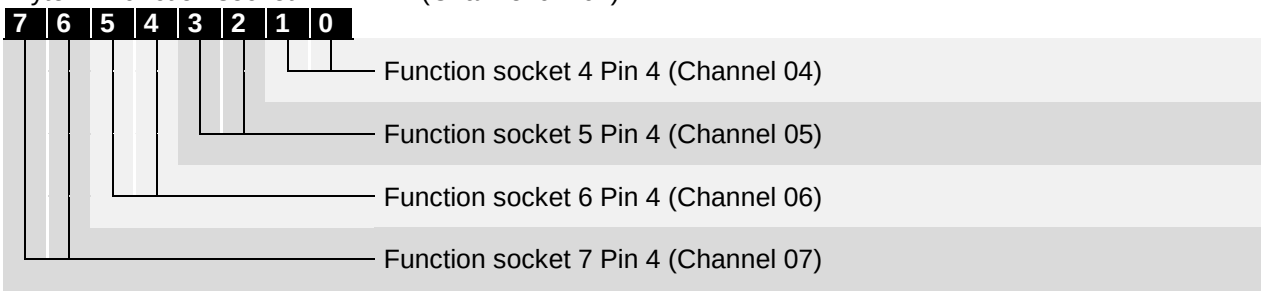

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Fig. 74 Bit assignment of byte 1

10.14 DI8 C 8xM8 – Art.No. 56622

10.14.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DI8 C 8xM8	56622	1 Byte	-	42hex 00hex DDhex 2Ehex

Tab. 162 Identification

10.14.2 Bit Assignment I/O - Data

10.14.2.1 Input Data IDM

Byte 0 (Pin 4 of M8 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

Tab. 163 Input data (IDM)

10.14.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

10.14.3.1 Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

Tab. 164 Function Pin 4

10.14.3.2 Parameterbytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	reserved
3	reserved

Tab. 165 Parameter bytes

10.14.3.3 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

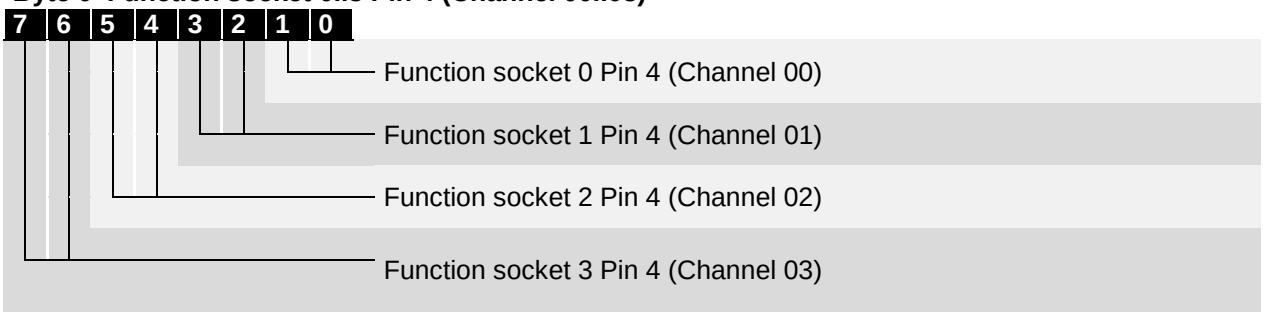

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Fig. 75 Bit assignment of byte 0

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

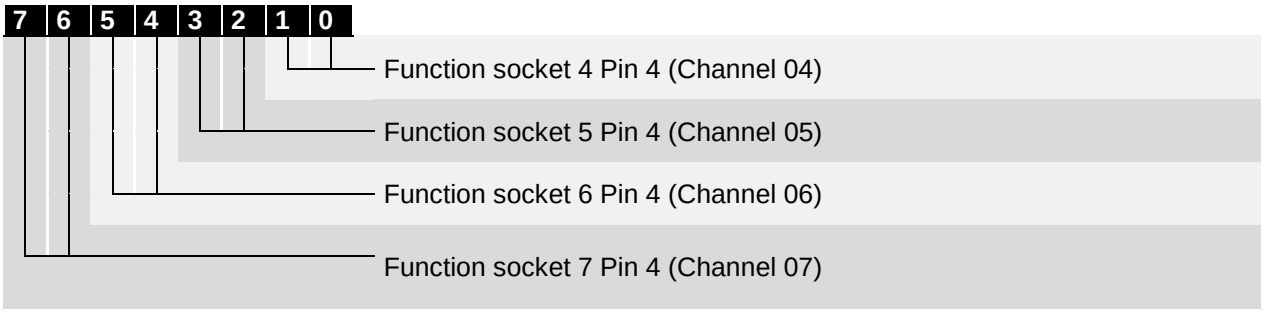

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Fig. 76 Bit assignment of byte 1

10.15 DI8 E 8xM8 – Art.No. 56623

10.15.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DI8 E 8xM8	56623	1 Byte	-	43_{hex} 00_{hex} DD_{hex} $2F_{hex}$ 04_{hex}

Tab. 166 Identification

10.15.2 Bit Assignment I/O - Data

10.15.2.1 Input Data IDM

Byte 0 (Pin 4 of M8 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

Tab. 167 Input data (IDM)

10.15.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

10.15.3.1 Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Reserved
3	1	1	Reserved

Tab. 168 Function Pin 4

10.15.3.2 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	reserved
3	reserved

Tab. 169 Parameter bytes

10.15.3.3 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Fig. 77 Bit assignment of byte 0

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

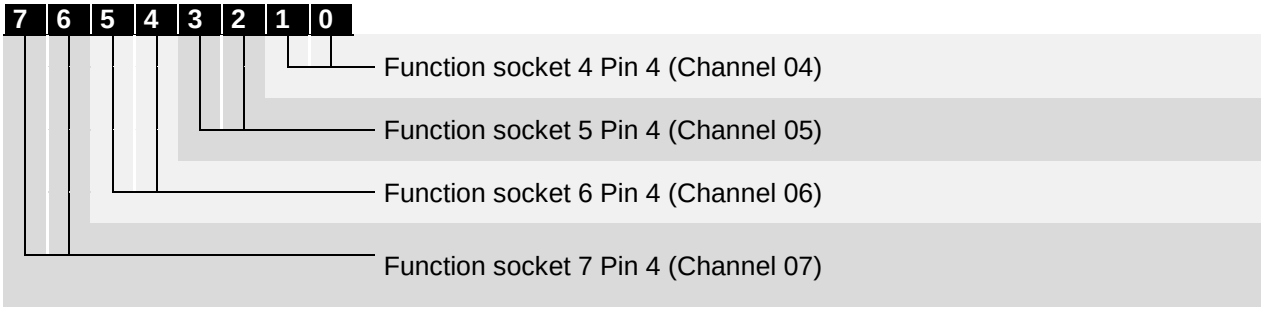

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Fig. 78 Bit assignment of byte 1

10.16 DI8 E 8xM8 NPN – Art.No. 56626

10.16.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DI8 E 8xM8 NPN	56626	1 Byte	-	43_{hex} 00_{hex} DD_{hex} 32_{hex} 04_{hex}

Tab. 170 Identification

10.16.2 Bit Assignment I/O - Data

10.16.2.1.1 Input Data IDM

Byte 0 (Pin 4 of M8 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

Tab. 171 Input data (IDM)

10.16.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

10.16.3.1 Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Reserved
3	1	1	Reserved

Tab. 172 Function Pin 4

10.16.3.2 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	reserved
3	reserved

Tab. 173 Parameter bytes

10.16.3.3 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Fig. 79 Bit assignment of byte 0

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

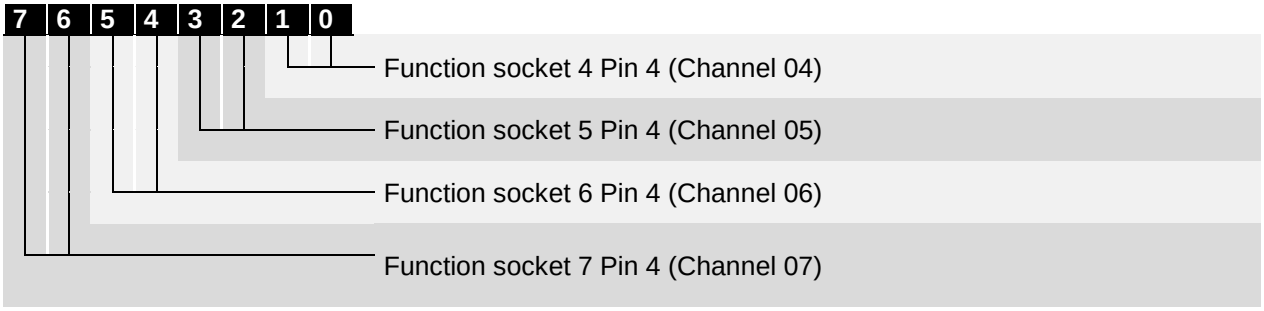

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Fig. 80 Bit assignment of byte 1

10.17 DIO8 E 4xM12 1A – Art.No. 56631

10.17.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DIO8 E 4xM12 1A	56631	2 Byte	2 Byte	$C3_{hex}$ 01_{hex} 01_{hex} DD_{hex} 37_{hex} 04_{hex}
DI8 E 4xM12 1A	56631	2 Byte	-	43_{hex} 01_{hex} 27_{hex} 11_{hex} 04_{hex}
DO8 E 4xM12 1A	56631	-	2 Byte	83_{hex} 01_{hex} 27_{hex} 12_{hex} 04_{hex}

Tab. 174 Identification

10.17.2 Bit Assignment I/O - Data

10.17.2.1 Input Data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	13	12	11	10

Tab. 175 Input data (IDM)

10.17.2.2 Output Data ODM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	13	12	11	10

Tab. 176 Output data (ODM)

10.17.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

10.17.3.1 Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	Output

Tab. 177 Function Pin 2

10.17.3.2 Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

Tab. 178 Function Pin 4

10.17.3.3 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 0..3 Pin 2 (Channel 10..13)
2	reserved
3	reserved

Tab. 179 Parameter bytes

10.17.3.4 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

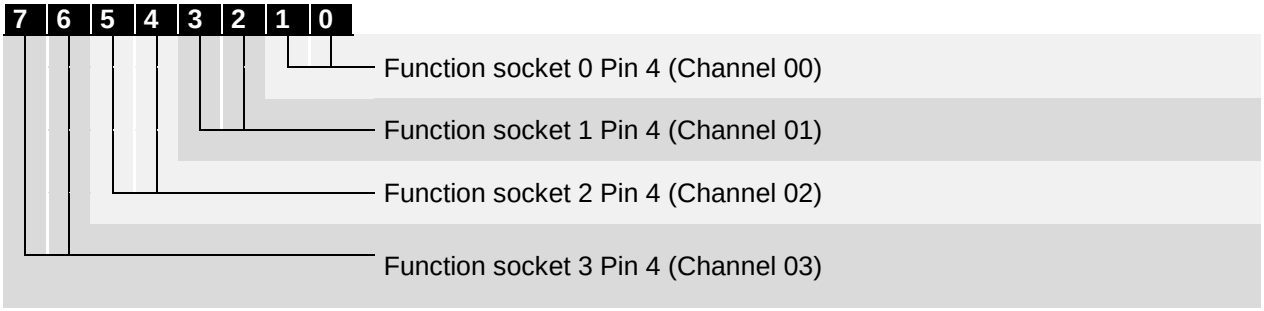

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Fig. 81 Bit assignment of byte 0

Byte 1 Function socket 0..3 Pin 2 (Channel 10..13)

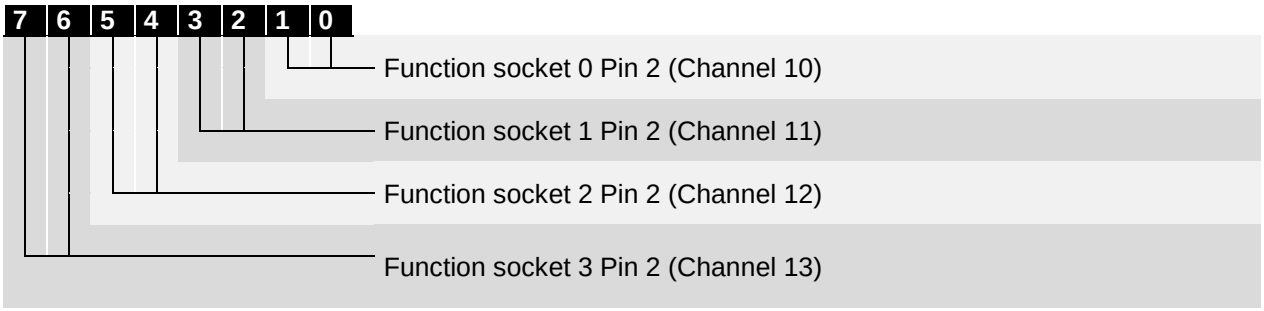

7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Fig. 82 Bit assignment of byte 1

10.18 DIO16 C 8xM12 1,6A – Art.No. 56640

10.18.1 Identification

Art.No.	Description	Process data		Identification
		Input	Output	
56640	DIO 16 C 8xM12 1,6A	2 Byte	2 Byte	$C3_{hex}$ 01_{hex} 01_{hex} DD_{hex} 40_{hex} 08_{hex}
56640	DI 16 C 8xM12 1,6A	2 Byte	2 Byte	43_{hex} 01_{hex} 27_{hex} 13_{hex} 08_{hex}
56640	DO 16 C 8xM12 1,6A	2 Byte	2 Byte	83_{hex} 01_{hex} 27_{hex} 14_{hex} 08_{hex}

Tab. 180 Identification

10.18.2 Bit assignment I/O data

Input Data (IDM)								
Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Tab. 181 Input data (IDM)

Output data (ODM)								
Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Tab. 182 Output data (ODM)

10.18.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

10.18.3.1 Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	Output

Tab. 183 Function Pin 2

10.18.3.2 Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

Tab. 184 Function Pin 4

10.18.3.3 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	Function socket 0..3 Pin 2 (Channel 10..13)
3	Function socket 4..7 Pin 2 (Channel 14..17)
4	reserved
5	reserved
6	reserved
7	reserved

Tab. 185 Parameter bytes

10.18.3.4 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

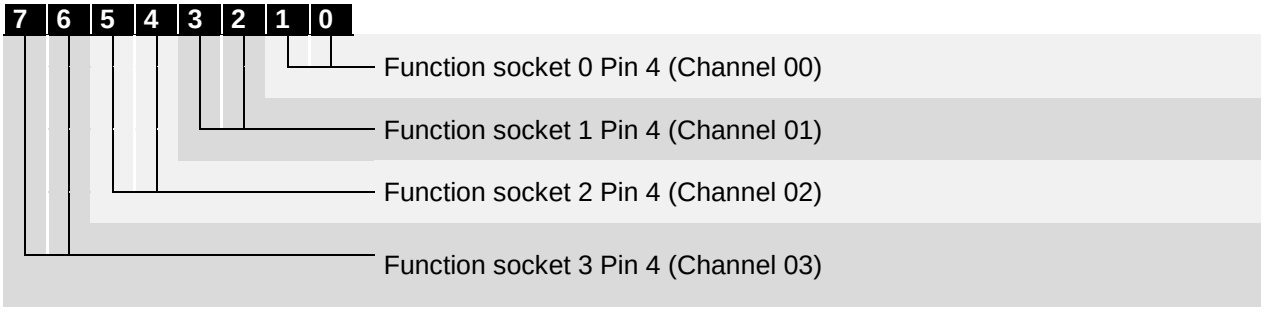

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Fig. 83 Bit assignment of byte 0

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

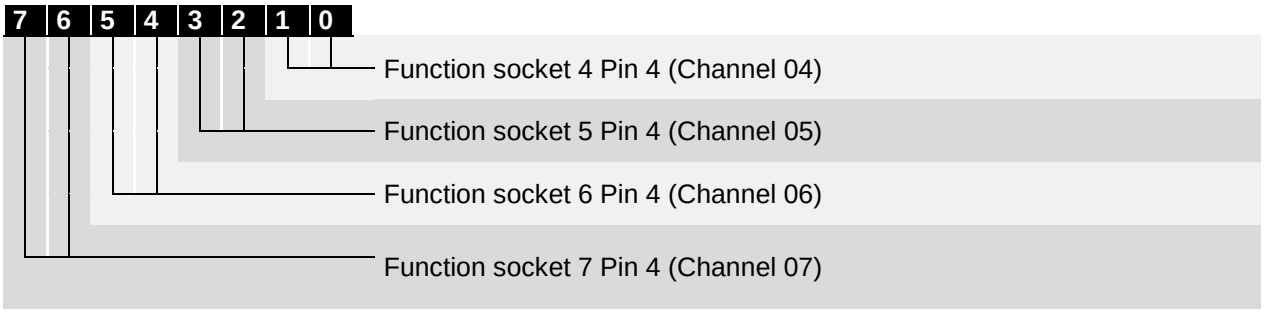

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Fig. 84 Bit assignment of byte 1

Byte 2 Function socket 0..3 Pin 2 (Channel 10..13)

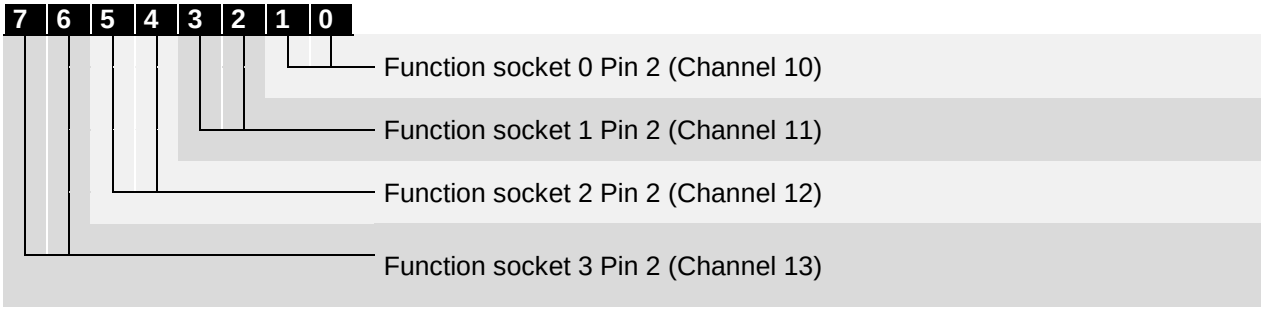

7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Fig. 85 Bit assignment of byte 2

Byte 3 Function socket 4..7 Pin 2 (Channel 14..17)

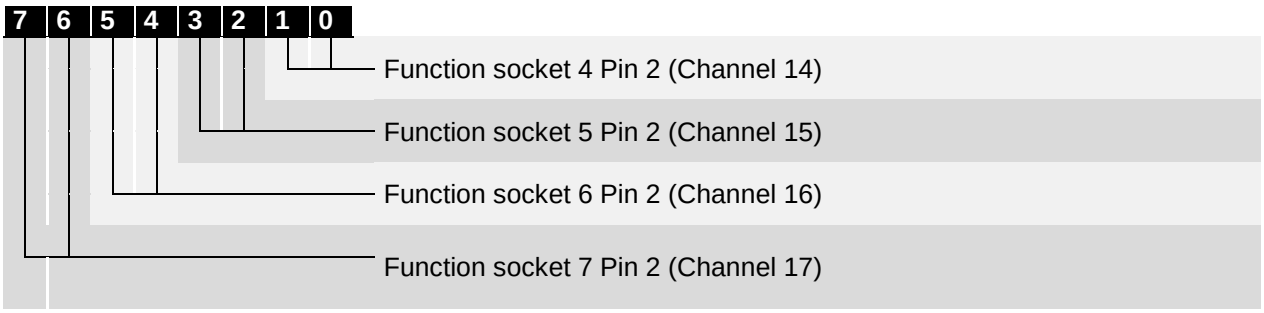

7 6 5 4 3 2 1 0
Function socket 4 Pin 2 (Channel 14)
Function socket 5 Pin 2 (Channel 15)
Function socket 6 Pin 2 (Channel 16)
Function socket 7 Pin 2 (Channel 17)

Fig. 86 Bit assignment of byte 3

10.19 DIO16 DO16 E 16xM12 (1,6/2A) – Art.No. 56641

10.19.1 Identification

Art.No.	Description	Process data		Identification
		Input	Output	
56641	DIO16 DO16 E 16xM12 (1,6/2A)	2 bytes	4 Byte	$C3_{Hex}$ 03_{Hex} 01_{Hex} DD_{Hex} 41_{Hex} $0D_{hex}$

Tab. 186 Identification

10.19.2 Bit assignment I/O data

Input data (IDM)								
Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Tab. 187 Input data (IDM)

Output data (ODM)								
Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10
Byte 2 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	27	26	25	24	23	22	21	20
Byte 3 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	37	36	35	34	33	32	31	30

Tab. 188 Output data (ODM)

10.19.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

10.19.3.1 Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	Output

Tab. 189 Function Pin 2

10.19.3.2 Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

Tab. 190 Function Pin 4

10.19.3.3 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	Function socket 0..3 Pin 2 (Channel 10..13)
3	Function socket 4..7 Pin 2 (Channel 14..17)
4	reserved
5	reserved
6	reserved
7	reserved

Tab. 191 Parameter bytes

10.19.3.4 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

Fig. 87 Bit assignment of byte 0

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

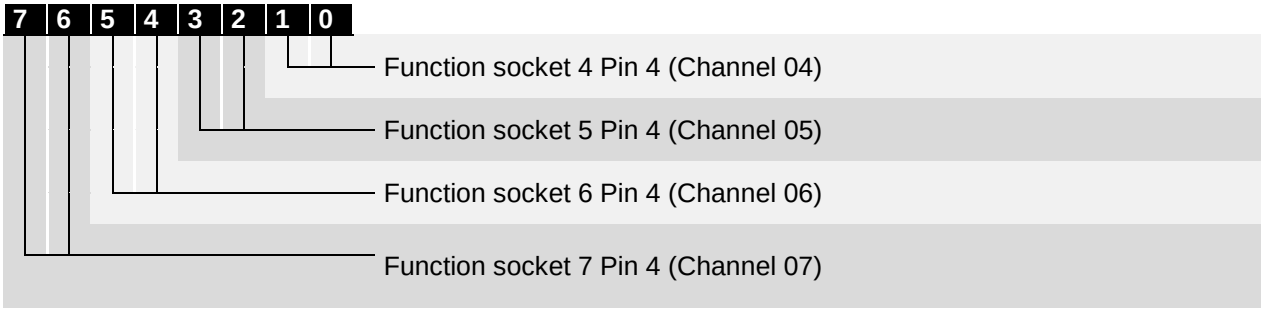

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Fig. 88 Bit assignment of byte 1

Byte 2 Function socket 0..3 Pin 2 (Channel 10..13)

7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Fig. 89 Bit assignment of byte 2

Byte 3 Function socket 4..7 Pin 2 (Channel 14..17)

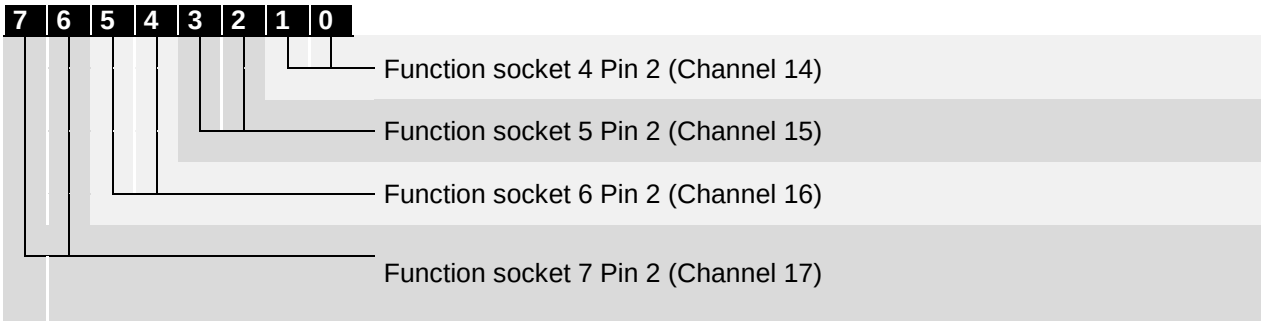

7 6 5 4 3 2 1 0
Function socket 4 Pin 2 (Channel 14)
Function socket 5 Pin 2 (Channel 15)
Function socket 6 Pin 2 (Channel 16)
Function socket 7 Pin 2 (Channel 17)

Fig. 90 Bit assignment of byte 3

10.20 DO16 C Valve K3 – Art.No. 56650

10.20.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DO16 C Valve K3	56650	-	2 bytes	83_{hex} 01_{hex} DD_{hex} $4A_{hex}$ 04_{hex}

Tab. 192 Identification

10.20.2 Bit assignment I/O data

10.20.2.1 Output data ODM

Byte 0 (Channel 00 to 07)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Channel 08 to 15)								
Bit	7	6	5	4	3	2	1	0
Channel	15	14	13	12	11	10	09	08

Tab. 193 Output data (ODM)

10.20.3 Parameter bytes

Byte	Signification
4	reserved
5	reserved
6	reserved
7	reserved

Tab. 194 Parameter bytes

10.21 DO8 C Valve CPV(9) K3 – Art.Nr. 5665003

10.21.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DO8 C Valve CPV(9) K3	5665003	-	2 Byte	83_{hex} 01_{hex} DD_{hex} $4A_{hex}$ 04_{hex}

Tab. 195 Kennung

10.21.2 Bit assignment I/O data

10.21.2.1 Output data ODM

Byte 0 (Channel 00 bis 07)								
Bit	7	6	5	4	3	2	1	0
Channel	free	free	05	04	free	free	01	00
Byte 1 (Channel 08 bis 15)								
Bit	7	6	5	4	3	2	1	0
Channel	free	free	13	12	free	free	09	08

Tab. 196 Output data ODM

10.21.3 Parameter bytes

Byte	Signification
4	reserved
5	reserved
6	reserved
7	reserved

Tab. 197 Parameter bytes

10.22 DO16 E Valve – Art.No. 56651xx

10.22.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DO16 E Valve	56651	-	2 bytes	83_{hex} 01_{hex} DD_{hex} $4B_{hex}$ 04_{hex}
DO16 E Valve CPV	5665100	-	2 bytes	83_{hex} 01_{hex} DD_{hex} $4B_{hex}$ 04_{hex}
DO16 E Valve V	5665101	-	2 bytes	83_{hex} 01_{hex} DD_{hex} $4B_{hex}$ 04_{hex}
DO16 E Valve V20/22	5665110	-	2 bytes	83_{hex} 01_{hex} DD_{hex} $4B_{hex}$ 04_{hex}
DO16 E Valve VM10	5665111	-	2 bytes	83_{hex} 01_{hex} DD_{hex} $4B_{hex}$ 04_{hex}
DO16 E Valve V20/22 B	5665112	-	2 bytes	83_{hex} 01_{hex} DD_{hex} $4B_{hex}$ 04_{hex}
DO16 E Valve SMC	5665113	-	2 bytes	83_{hex} 01_{hex} DD_{hex} $4B_{hex}$ 04_{hex}
DO16 E Valve SMC M27	5665114	-	2 bytes	83_{hex} 01_{hex} DD_{hex} $4B_{hex}$ 04_{hex}
DO16 E Valve V20/22 C	5665115	-	2 bytes	83_{hex} 01_{hex} DD_{hex} $4B_{hex}$ 04_{hex}
DO16 E Valve CPV VA	5665150	-	2 bytes	83_{hex} 01_{hex} DD_{hex} $4B_{hex}$ 04_{hex}
DO16 E Valve CPV VA	5665151	-	2 bytes	83_{hex} 01_{hex} DD_{hex} $4B_{hex}$ 04_{hex}

Tab. 198 Identification

10.22.2 Bit assignment I/O data

10.22.2.1 Output data ODM

Byte 0 (Channel 00 to 07)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Channel 08 to 15)								
Bit	7	6	5	4	3	2	1	0
Channel	15	14	13	12	11	10	09	08

Tab. 199 Output data (ODM)

10.22.3 Parameter bytes

Byte	Signification
4	reserved
5	reserved
6	reserved
7	reserved

Tab. 200 Parameter bytes

10.23 DO16 E MAC – Art.No. 56653

10.23.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DO16 E MAC	56653	-	2 bytes	83_{hex} 01_{hex} DD_{hex} $4D_{hex}$ 04_{hex}

Tab. 201 Identification

10.23.2 Bit assignment I/O data

10.23.2.1 Output data ODM

Byte 0 (Channel 00 to 07)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Channel 08 to 15)								
Bit	7	6	5	4	3	2	1	0
Channel	15	14	13	12	11	10	09	08

Tab. 202 Output data (ODM)

10.23.3 Parameter bytes

Byte	Signification
4	reserved
5	reserved
6	reserved
7	reserved

Tab. 203 Parameter bytes

10.24 DO8 E Valve – Art.No. 56655xx

10.24.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DO8 E Valve	56655	-	1 Byte	83_{hex} 00_{hex} DD_{hex} $4F_{hex}$ 02_{hex}
DO8 E Valve CPV	5665500	-	1 Byte	83_{hex} 00_{hex} DD_{hex} $4F_{hex}$ 02_{hex}
DO8 E Valve CPV (9)	5665501	-	1 Byte	83_{hex} 00_{hex} DD_{hex} $4F_{hex}$ 02_{hex}

Tab. 204 Identification

10.24.2 Bit assignment I/O data

10.24.2.1 Output data ODM

Byte 0 (Channel 00 to 07)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

Tab. 205 Output data (ODM)

10.24.3 Parameter bytes

Byte	Signification
4	reserved
5	reserved

Tab. 206 Parameter bytes

10.25 DO32 E Valve 0,5A– Art.No. 56656xx

10.25.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DO32 E Valve 0,5A	56656	-	4 Byte	83_{hex} 03_{hex} DD_{hex} 50_{hex} 08_{hex}
DO24 E Valve VM10	5665600	-	4 Byte	83_{hex} 03_{hex} DD_{hex} 50_{hex} 08_{hex}
DO32 E Valve MPA	5665601	-	4 Byte	83_{hex} 03_{hex} DD_{hex} 50_{hex} 08_{hex}
DO32 E Valve HF03	5665602	-	4 Byte	83_{hex} 03_{hex} DD_{hex} 50_{hex} 08_{hex}
DO32 E Valve VM10	5665603	-	4 Byte	83_{hex} 03_{hex} DD_{hex} 50_{hex} 08_{hex}
DO23 E Valve SMC	5665604	-	4 Byte	83_{hex} 03_{hex} DD_{hex} 50_{hex} 08_{hex}
DO22 E Valve CPA	5665605	-	4 Byte	83_{hex} 03_{hex} DD_{hex} 50_{hex} 08_{hex}
DO24 E Valve HF04	5665606	-	4 Byte	83_{hex} 03_{hex} DD_{hex} 50_{hex} 08_{hex}
DO24 E Valve SMC M27	5665607	-	4 Byte	83_{hex} 03_{hex} DD_{hex} 50_{hex} 08_{hex}

Tab. 207 Identification

10.25.2 Bit assignment I/O data

10.25.2.1 Output data ODM

Byte 0 (Channel 00 to 07)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Channel 08 to 15)								
Bit	7	6	5	4	3	2	1	0
Channel	15	14	13	12	11	10	09	08
Byte 2 (Channel 16 to 23)								
Bit	7	6	5	4	3	2	1	0
Channel	23	22	21	20	19	18	17	16
Byte 3 (Channel 24 to 31)								
Bit	7	6	5	4	3	2	1	0
Channel	31	30	29	28	27	26	25	24

Tab. 208 Output data (ODM)

10.25.3 Parameter bytes

Byte	Signification
4	reserved
5	reserved
6	reserved
7	reserved
8	reserved
9	reserved
10	reserved
11	reserved

Tab. 209 Parameter bytes

10.26 DO32 E MAC – Art.No. 56657

10.26.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DO32 E MAC 0,5A	56657	-	4 Byte	83_{hex} 03_{hex} DD_{hex} 51_{hex} 08_{hex}

Tab. 210 Identification

10.26.2 Bit assignment I/O data

10.26.2.1 Output data ODM

Byte 0 (Channel 00 to 07)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Channel 08 to 15)								
Bit	7	6	5	4	3	2	1	0
Channel	15	14	13	12	11	10	09	08
Byte 2 (Channel 16 to 23)								
Bit	7	6	5	4	3	2	1	0
Channel	23	22	21	20	19	18	17	16
Byte 3 (Channel 24 to 31)								
Bit	7	6	5	4	3	2	1	0
Channel	31	30	29	28	27	26	25	24

Tab. 211 Output data (ODM)

10.26.3 Parameter bytes

Byte	Signification
4	reserved
5	reserved
6	reserved
7	reserved
8	reserved
9	reserved
10	reserved
11	reserved

Tab. 212 Parameter bytes

10.27 DIO8 E Cable (ArtNr. 56661), DIO8 E Cable 2m (5666100), DIO8 E Cable M12 ID (5666500)

10.27.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DIO8 E Cable	56661	1 Byte	1 Byte	$C3_{hex}$ 00_{hex} 00_{hex} DD_{hex} 55_{hex} 04_{hex}
DIO8 E Cable 2m	5666100	1 Byte	1 Byte	$C3_{hex}$ 00_{hex} 00_{hex} DD_{hex} 55_{hex} 04_{hex}
DI8 E Cable M12 ID	56661	1 Byte	-	43_{hex} 00_{hex} 27_{hex} 15_{hex} 04_{hex}
DO8 E Cable M12 ID	56661	-	1 Byte	83_{hex} 00_{hex} 27_{hex} 16_{hex} 04_{hex}
DIO8 E Cable M12 ID	5666500	1 Byte	1 Byte	$C3_{hex}$ 00_{hex} 00_{hex} DD_{hex} 59_{hex} 02_{hex}

Tab. 213 Identification

10.27.2 Bit assignment I/O data

10.27.2.1 Input data IDM

Byte 0								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

Tab. 214 Input data (IDM)

10.27.2.2 Output data ODM

Byte 0								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

Tab. 215 Output data (ODM)

10.27.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible.

10.27.3.1 Function I/O

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

Tab. 216 Function I/O

10.27.3.2 Parameter bytes

Byte	Signification
0	Function Channel 00..03
1	Function Channel 04..07
2	reserved
3	reserved

Tab. 217 Parameter bytes

10.27.3.3 Bit assignment of parameter bytes

Byte 0 Function Channel 00..03

Fig. 91 Bit assignment of byte 0

Byte 1 Function Channel 04..07

Fig. 92 Bit assignment of byte 1

10.28 DIO16 E Cable 0,5A – ArtNr. 56662

10.28.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DIO16 E Cable	56662	2 Byte	2 Byte	$C3_{hex}$ 01_{hex} 01_{hex} DD_{hex} 56_{hex} 08_{hex}
DI16 E Cable	56662	2 Byte	-	43_{hex} 01_{hex} 027_{hex} 17_{hex} 08_{hex}
DO16 E Cable	56662	-	2 Byte	83_{hex} 01_{hex} 27_{hex} 18_{hex} 08_{hex}

Tab. 218 Identification

10.28.2 Bit assignment I/O data

10.28.2.1 Input data IDM

Byte 0 (Channel 00 to 07)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Channel 08 to 15)								
Bit	7	6	5	4	3	2	1	0
Channel	15	14	13	12	11	10	09	08

Tab. 219 Input data (IDM)

10.28.2.2 Output data ODM

Byte 0 (Channel 00 to 07)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Channel 08 to 15)								
Bit	7	6	5	4	3	2	1	0
Channel	15	14	13	12	11	10	09	08

Tab. 220 Output data (ODM)

10.28.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible.

10.28.3.1 Function I/O

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

Tab. 221 Function I/O

10.28.3.2 Parameter bytes

Byte	Signification
0	Function Channel 00..03
1	Function Channel 04..07
2	Function Channel 08..11
3	Function Channel 12..15

Tab. 222 Parameter bytes

10.28.3.3 Bit assignment of parameter bytes

Byte 0 Function Channel 00..03
7 6 5 4 3 2 1 0
Function Channel 00
Function Channel 01
Function Channel 02
Function Channel 03

Fig. 93 Bit assignment of byte 0

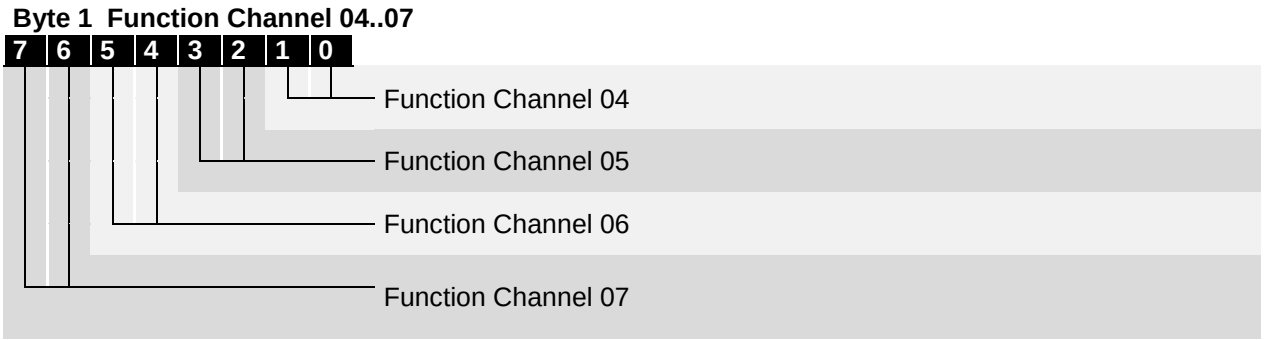

Byte 1 Function Channel 04..07
7 6 5 4 3 2 1 0
Function Channel 04
Function Channel 05
Function Channel 06
Function Channel 07

Fig. 94 Bit assignment of byte 1

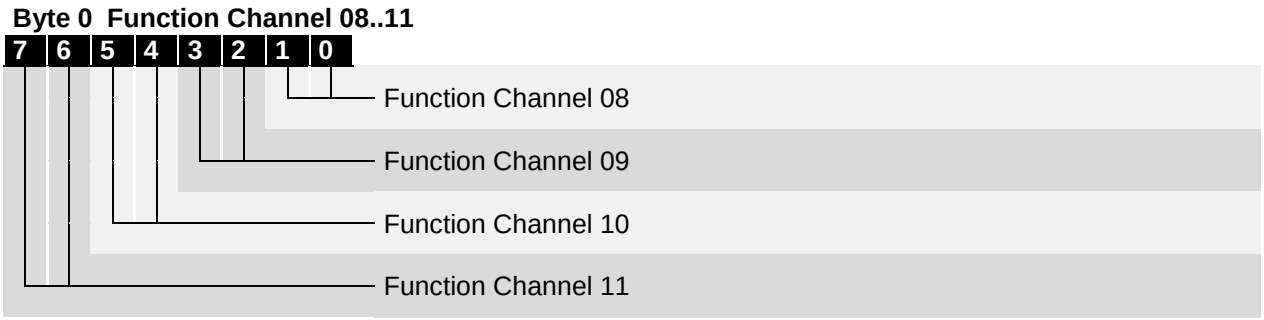

Byte 0 Function Channel 08..11
7 6 5 4 3 2 1 0
Function Channel 08
Function Channel 09
Function Channel 10
Function Channel 11

Fig. 95 Bit assignment of byte 0

Byte 1 Function Channel 12..15
7 6 5 4 3 2 1 0
Function Channel 12
Function Channel 13
Function Channel 14
Function Channel 15

Fig. 96 Bit assignment of byte 1

10.29 DIO8 E M16 0,5A – ArtNr. 56663

10.29.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DIO8 E M16 0,5A	56663	1 Byte	1 Byte	$C3_{hex}$ 00_{hex} 00_{hex} DD_{hex} 57_{hex} 04_{hex}
DI8 E M16 0,5A	56663	1 Byte	-	43_{hex} 00_{hex} 27_{hex} 19_{hex} 04_{hex}
DO8 E M16 0,5A	56663	-	1 Byte	83_{hex} 00_{hex} 27_{hex} $1A_{hex}$ 04_{hex}

Tab. 223 Identification

10.29.2 Bit assignment I/O data

10.29.2.1 Input data IDM

Byte 0								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

Tab. 224 Input data (IDM)

10.29.2.2 Output data ODM

Byte 0								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

Tab. 225 Output data (ODM)

10.29.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible.

10.29.3.1 Function I/O

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

Tab. 226 Function I/O

10.29.3.2 Parameter bytes

Byte	Signification
0	Function Channel 00..03
1	Function Channel 04..07
2	reserved
3	reserved

Tab. 227 Parameter bytes

10.29.3.3 Bit assignment parameter bytes

Byte 0 Function Channel 00..03

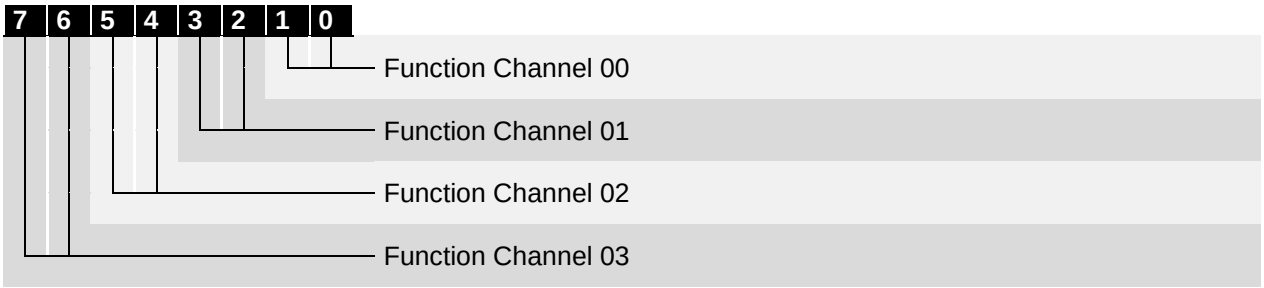


Fig. 97 Bit assignment of byte 0

Byte 1 Function Channel 04..07

Fig. 98 Bit assignment of byte 1

10.30 DI16/DO16 E Cable 0,5 A – Art.Nr. 56671xx

10.30.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DI16/DO16 E Cable 0,5 A	56671	2 Byte	2 Byte	43_{hex} 01_{hex} 01_{hex} DD_{hex} $5F_{hex}$ 04_{hex}

Tab. 228 Identification

10.30.2 Bit assignment I/O data

10.30.2.1 Input data IDM

Byte 0								
Bit	7	6	5	4	3	2	1	0
Channel	IN 8	7	6	5	4	3	2	IN 1
Byte 1								
Bit	7	6	5	4	3	2	1	0
Channel	IN 16	15	14	13	12	11	10	IN 9

Tab. 229 Input data IDM

10.30.2.2 Output data ODM

Byte 0								
Bit	7	6	5	4	3	2	1	0
Channel	OUT 8	7	6	5	4	3	2	OUT 1
Byte 1								
Bit	7	6	5	4	3	2	1	0
Channel	OUT 16	15	14	13	12	11	10	OUT 9

Tab. 230 Output data ODM

10.30.2.3 Parameter bytes

Byte	Signification
0	reserved
1	reserved
2	reserved
3	reserved

Tab. 231 Parameter bytes

10.31 DIO8/DI8 E TB Box – Art.No. 56681

10.31.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DIO8/DI8 E TB Box	56681	2 bytes	2 bytes	$C3_{hex}$ 01_{hex} 01_{hex} DD_{hex} 69_{hex} 06_{hex}

Tab. 232 Identification

10.31.2 Bit assignment I/O data

10.31.2.1 Input data IDM

Byte 0 (Terminal X1)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Terminal X0)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

Tab. 233 Input data (IDM)

10.31.2.2 Output data ODM

Byte 0 (Terminal X1)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Terminal X0)								
Bit	7	6	5	4	3	2	1	0
Channel	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved

Tab. 234 Output data (ODM)

10.31.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of channel 00 to 07 (X0) and Channel 00 to 07 (X1) differs.

10.31.3.1 Function X0 Channel 00 to 07

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

Tab. 235 Function X0 Channel 00 to 07

10.31.3.2 Function X1 Channel 00 to 07

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

Tab. 236 Function X1 Channel 00 to 07

10.31.3.3 Parameter bytes

Byte	Signification
0	Function Channel 00..03
1	Function Channel 04..07
2	Function Channel 00..03
3	Function Channel 04..07
4	reserved
5	reserved

Tab. 237 Parameter bytes

10.31.3.4 Bit assignment of parameter bytes

Byte 0 Function Channel X0 00..03

Fig. 99 Bit assignment of byte 0

Byte 1 Function Channel X0 04..07

Fig. 100 Bit assignment of byte 1

Byte 2 Function Channel X1 00..03

Fig. 101 Bit assignment of byte 2

Byte 3 Function Channel X1 04..07

Fig. 102 Bit assignment of byte 3

10.32 DIO8/DI8 E TB Rail – Art.No. 56691

10.32.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DIO8/DI8 E TB Rail	56691	2 bytes	2 bytes	$C3_{hex}$ 01_{hex} 01_{hex} DD_{hex} 73_{hex} 06_{hex}

Tab. 238 Identification

10.32.2 Bit assignment I/O data

10.32.2.1 Input data IDM

Byte 0 (Terminal X1)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Terminal X0)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

Tab. 239 Input data (IDM)

10.32.2.2 Output data ODM

Byte 0 (Terminal X1)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Terminal X0)								
Bit	7	6	5	4	3	2	1	0
Channel	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved

Tab. 240 Output data (ODM)

10.32.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of channel 00 to 07 (X0) and Channel 00 to 07 (X1) differs.

10.32.3.1 Function channel X0 00

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

Tab. 241 Function channel X0 00

10.32.3.2 Function X1 Channel 00 to 07

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

Tab. 242 Function X1 Channel 00 to 07

10.32.3.3 Parameter bytes

Byte	Signification
0	Function Channel 00..03
1	Function Channel 04..07
2	Function Channel 00..03
3	Function Channel 04..07
4	reserved
5	reserved

Tab. 243 Parameter bytes

10.32.3.4 Bit assignment parameter bytes

Byte 0 Function Channel X0 00..03

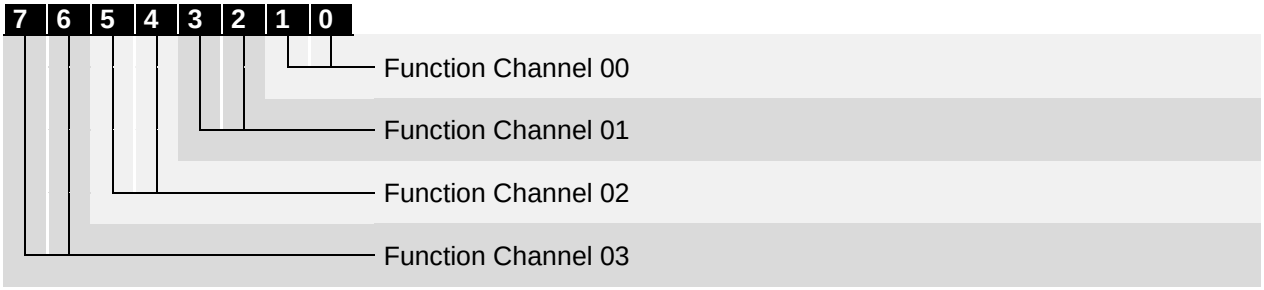


Fig. 103 Bit assignment of byte 0

Byte 1 Function Channel X0 04..07

Fig. 104 Bit assignment of byte 1

Byte 2 Function Channel X1 00..03

Fig. 105 Bit assignment of byte 2

Byte 3 Function Channel X1 04..07

Fig. 106 Bit assignment of byte 3

11 Cube67 Analog I/O Modules

11.1 Specific Characteristics

11.1.1 Smoothing (AI4 (U) and AI4(I) modules only)

The analog signal can be prefiltered in the device, in order to reduce sensitivity to short-term jitter.

The measuring time per channel is 2.0 ms. The total cycle time is the result of the measuring time per channel + 2.5 ms. The diagram below illustrates the module behavior to a step response in an active channel.

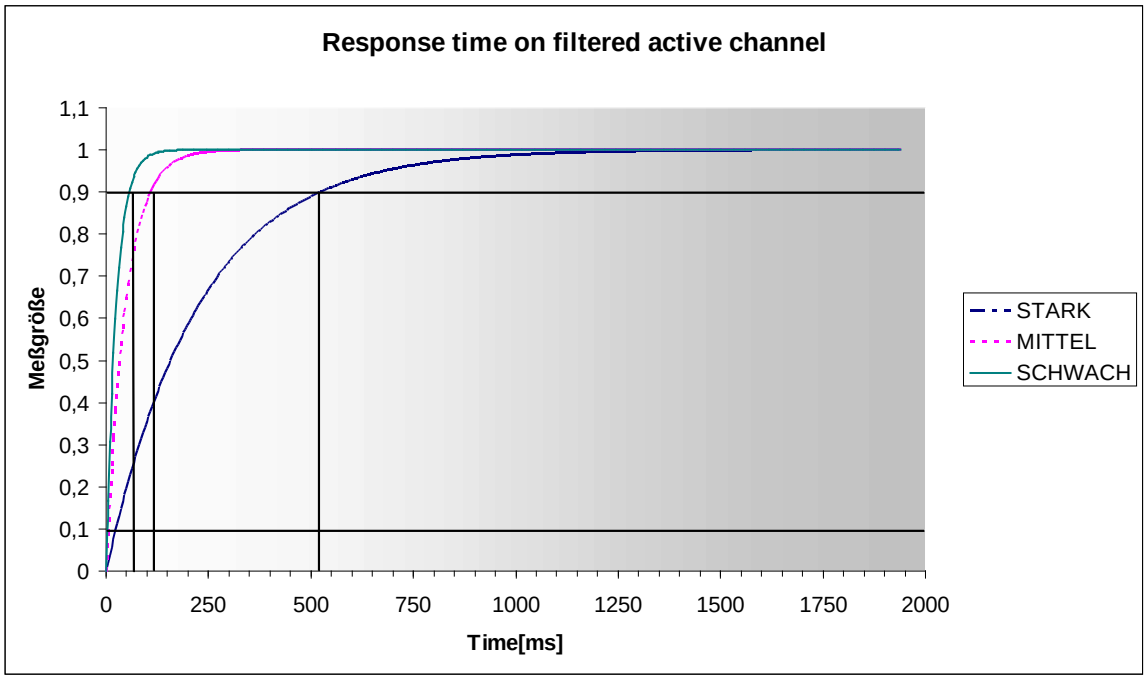


Fig. 107 Time-dependent behavior of smoothing in Cube67 AI4 (U/I) modules

11.1.2 Delta (AI4 (U) and AI4(I) Modules Only

This value sets the number of increments to increase or reduce the last measured value, in order to send the analogue input value from the AI module to the bus node. This parameter can be used for reducing the bus load of the internal system connection.

Example: The last value measured was 1000. With a delta of 100, the next measurand will only be sent, if it is < 900 or > 1100.

11.1.3 50/60 Hz filter (AI4-RTD and AI4-TH only)

With the 50/60 Hz filter noise on the cabling can be suppressed. The AD converter from the RTD module will be switched into a special mode. As a result the cycle time will be 10 times higher than the standard time. When using platinum 1000 and nickel 1000 RTD sensors, using this filter is recommended.

11.2 AI4 C 4xM12 (U) – Art.No. 56700

11.2.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AI4 C 4xM12 (U)	56700	4 Words	-	43_{hex} 43_{hex} DD_{hex} $7C_{hex}$ 10_{hex}

Tab. 244 Identification

11.2.2 I/O Data

11.2.2.1 Input Data IDM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Value	Channel 0		Channel 1		Channel 2		Channel 3	

Tab. 245 Input data (IDM)

11.2.2.2 Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	VZ	214	213	212	211	210	29	28	27	26	25	24	23	22	21	20

Tab. 246 Byte sequence High/Low - Motorola (Standard setting)

11.2.2.3 Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	27	26	25	24	23	22	21	20	VZ	214	213	212	211	210	29	28

Tab. 247 Byte sequence Low/High - Intel

VZ = Sign

VZ = 0 Positive value

VZ = 1 Negative value

11.2.2.4 Representation of Analog Values

Measuring range 0..10 V	Measuring value			Range	Diagnostic
	binary	hexadecimal	decimal		
>10 V	0111 1111 1111 1111	7FFF	32767	Overshooting	Yes
10 V 5V 0.305mV 0	0111 1111 1111 1111 0011 1111 1111 1111 0000 0000 0000 0001 0000 0000 0000 0000	7FFF 3FFF 0001 0000	32767 16383 1 0	Nominal range	-
< 0V	0000 0000 0000 0000	0000	0	Undershooting	-

Tab. 248 Measuring range 0..10 V

Measuring range +/-10 V	Measuring value			Range	Diagnostic
	binary	hexadecimal	decimal		
>10 V	0111 1111 1111 1111	7FFF	32767	Overshooting	Yes
10 V 5V 0.305mV 0	0111 1111 1111 1111 0011 1111 1111 1111 0000 0000 0000 0001 0000 0000 0000 0000	7FFF 3FFF 0001 0000	32767 16383 1 0	Nominal range	-
-0.305mV -5V -10V	1111 1111 1111 1111 1100 0000 0000 0001 1000 0000 0000 0000	FFFF C000 8000	-1 -16384 -32768	Nominal range	-
< -10V	1000 0000 0000 0000	8000	-32768	Undershooting	Yes

Tab. 249 Measuring range +/-10 V

11.2.3 Parameter bytes

Byte	Signification
0	Settings Channel 0
1	Reserved
2	Channel 0 : Delta
3	
4	Settings Channel 1
5	Reserved
6	Channel 1 : Delta
7	
8	Settings Channel 2
9	Reserved
10	Channel 2 : Delta
11	
12	Settings Channel 3
13	Reserved
14	Channel 3 : Delta
15	

Tab. 250 Parameter bytes

11.2.3.1 Bit assignment of parameter bytes

Byte 0,4,8,12 Settings Channel 0,1,2,3

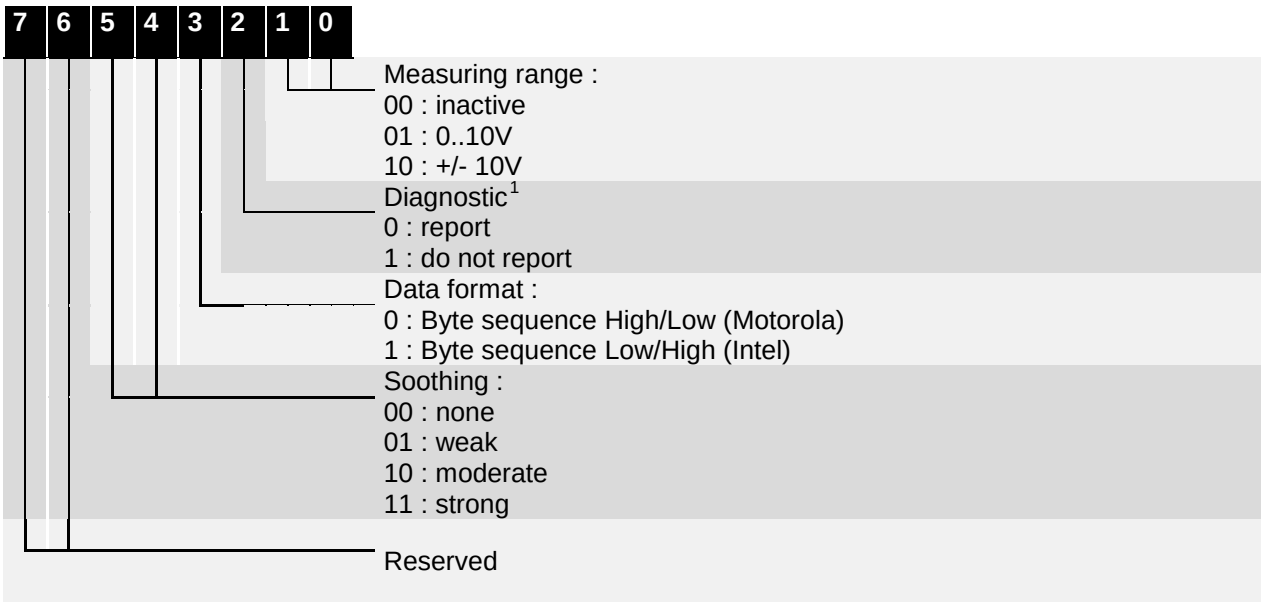


Fig. 108 Bit assignment of byte 0,4,8,12

[1] Diagnostic information of the corresponding channel.

Byte (2,3),(6,7),(10,11),(14,15) Channel (0,1,2,3) : Delta

Data type	Unsigned16
Admissible values	0..32767

Tab. 251 Bit assignment of byte (2,3),(6,7),(10,11),(14,15)

Unused channels should be disabled in order to optimize cycle time.

11.3 AI4 E 4xM12 (U) – Art.No. 56701; AI4 E 4xM12 (U) VA – Art.No. 5670150

11.3.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AI4 E 4xM12 (U)	56701	4 Words	-	43_{hex} 43_{hex} DD_{hex} $7D_{hex}$ 10_{hex}
AI4 E 4xM12 (U) VA	5670150	4 Words	-	43_{hex} 43_{hex} DD_{hex} $7D_{hex}$ 10_{hex}

Tab. 252 Identification

11.3.2 I/O Data

11.3.2.1 Input Data IDM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

Tab. 253 Input data (IDM)

11.3.2.2 Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	VZ	214	213	212	211	210	29	28	27	26	25	24	23	22	21	20

Tab. 254 Byte sequence High/Low - Motorola (Standard setting)

11.3.2.3 Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	27	26	25	24	23	22	21	20	VZ	214	213	212	211	210	29	28

Tab. 255 Byte sequence Low/High - Intel

VZ = Sign

VZ = 0 Positive value

VZ = 1 Negative value

11.3.2.4 Representation of Analog Values

Measuring range 0..10 V	Measuring value			Range	Diagnostic
	binary	hexadecimal	decimal		
>10 V	0111 1111 1111 1111	7FFF	32767	Overshooting	Yes
10 V 5V 0.305mV 0	0111 1111 1111 1111 0011 1111 1111 1111 0000 0000 0000 0001 0000 0000 0000 0000	7FFF 3FFF 0001 0000	32767 16383 1 0	Nominal range	-
< 0V	0000 0000 0000 0000	0000	0	Undershooting	-

Tab. 256 Measuring range 0..10 V

Measuring range +/-10 V	Measuring value			Range	Diagnostic
	binary	hexadecimal	decimal		
>10 V	0111 1111 1111 1111	7FFF	32767	Overshooting	Yes
10 V 5V 0.305mV 0	0111 1111 1111 1111 0011 1111 1111 1111 0000 0000 0000 0001 0000 0000 0000 0000	7FFF 3FFF 0001 0000	32767 16383 1 0	Nominal range	-
-0.305mV -5V -10V	1111 1111 1111 1111 1100 0000 0000 0001 1000 0000 0000 0000	FFFF C000 8000	-1 -16384 -32768	Nominal range	-
< -10V	1000 0000 0000 0000	8000	-32768	Undershooting	Yes

Tab. 257 Measuring range +/-10 V

11.3.3 Parameter bytes

Byte	Signification
0	Settings Channel 0
1	Reserved
2	Channel 0 : Delta
3	
4	Settings Channel 1
5	Reserved
6	Channel 1 : Delta
7	
8	Settings Channel 2
9	Reserved
10	Channel 2 : Delta
11	
12	Settings Channel 3
13	Reserved
14	Channel 3 : Delta
15	

Tab. 258 Parameter bytes

11.3.3.1 Bit assignment of parameter bytes

Byte 0,4,8,12 Settings Channel 0,1,2,3

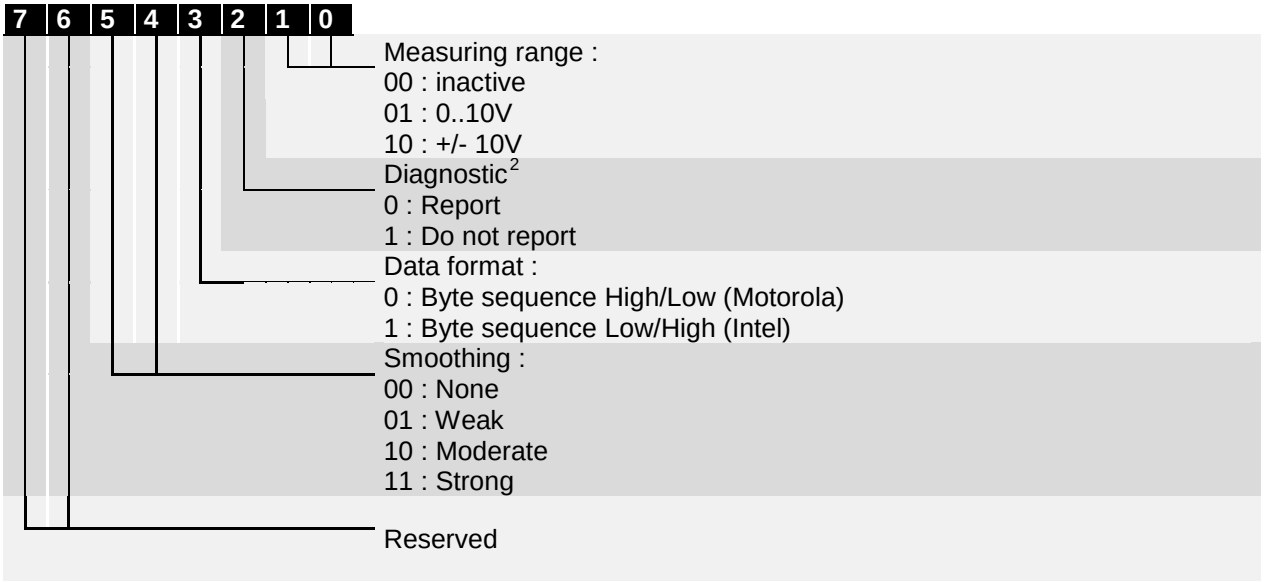


Fig. 109 Bit assignment of byte 0,4,8,12

[2] Diagnostic information of the corresponding channel.

Byte (2,3),(6,7),(10,11),(14,15) Channel (0,1,2,3) : Delta

Data type	Unsigned16
Admissible values	0..32767

Tab. 259 Bit assignment of bytes (2,3),(6,7),(10,11),(14,15)

Unused channels should be disabled in order to optimize cycle time.

11.4 AO4 C 4xM12 (U) – Art.No. 56710

11.4.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AO4 C 4xM12 (U)	56710	-	4 Words	83_{hex} 43_{hex} DD_{hex} 86_{hex} 10_{hex}

Tab. 260 Identification

11.4.2 I/O Data

11.4.2.1 Output Data ODM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

Tab. 261 Output data (ODM)

11.4.2.2 Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	VZ	-	-	-	-	210	29	28	27	26	25	24	23	22	21	20

Tab. 262 Byte sequence High/Low - Motorola (Standard setting)

11.4.2.3 Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	27	26	25	24	23	22	21	20	VZ	-	-	-	-	210	29	28

Tab. 263 Byte sequence Low/High - Intel

11.4.2.4 Representation of Analog Values

Output range 0..10 V	Measuring value			Range
	binary	hexadecimal	decimal	
10 V 5V 0.305mV 0	0000 0111 1111 1111 0000 0011 1111 1111 0000 0000 0000 0001 0000 0000 0000 0000	07FF 03FF 0001 0000	2047 1023 1 0	Nominal range

Tab. 264 Output range 0..10 V

Output range +/-10 V	Measuring value			Range
	binary	hexadecimal	decimal	
10 V 5V 0.305mV 0	0000 0111 1111 1111 0000 0011 1111 1111 0000 0000 0000 0001 0000 0000 0000 0000	07FF 03FF 0001 0000	2047 1023 1 0	Nominal range
-0.305mV -5V -10V	1xxx x111 1111 1111 1xxx x100 0000 0001 1xxx x000 0000 0001	FFFF FC01 F800	-1 -1023 -2048	Nominal range

Tab. 265 Output range +/-10 V

11.4.3 Parameter bytes

Byte	Signification
0	Settings Channel 0
1	Reserved
2	Reserved
3	Reserved
4	Settings Channel 1
5	Reserved
6	Reserved
7	Reserved
8	Settings Channel 2
9	Reserved
10	Reserved
11	Reserved
12	Settings Channel 3
13	Reserved
14	Reserved
15	Reserved

Tab. 266 Parameter bytes

11.4.3.1 Bit assignment of parameter bytes

Byte 0,4,8,12 Settings Channel 0,1,2,3

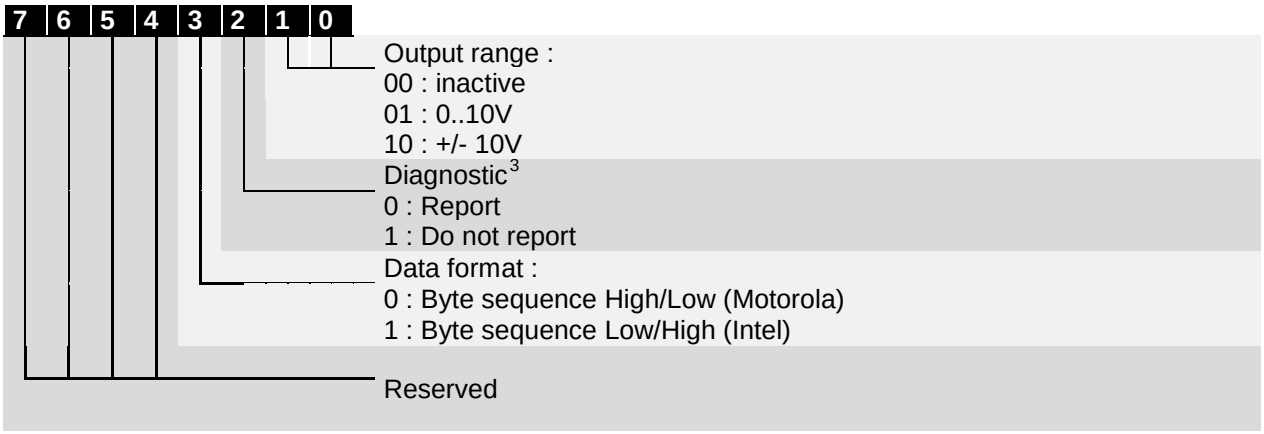


Fig. 110 Bit assignment of byte 0,4,8,12

Unused channels should be disabled in order to optimize cycle time.

11.5 AO4 E 4xM12 (U) – Art.No. 56711

11.5.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AO4 E 4xM12 (U)	56711	-	4 Words	83_{hex} 43_{hex} DD_{hex} 87_{hex} 10_{hex}

Tab. 267 Identification

11.5.1.1 I/O Data

11.5.1.2 Output Data ODM

Word	**0**		**1**		**2**		**3**	
Byte	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

Tab. 268 Output data (ODM)

[3] Diagnostic information of the corresponding channel.

11.5.1.3 Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	VZ	-	-	-	-	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}

Tab. 269 Byte sequence High/Low - Motorola (Standard setting)

11.5.1.4 Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	VZ	-	-	-	-	2^{10}	2^{9}	2^{8}

Tab. 270 Byte sequence Low/High - Intel

11.5.1.5 Representation of Analog Values

Output range 0 … 10 V	Measuring value			Range
	binary	hexadecimal	decimal	
10 V 5V 4.885mV 0	0000 0111 1111 1111 0000 0011 1111 1111 0000 0000 0000 0001 0000 0000 0000 0000	07FF 03FF 0001 0000	2047 1023 1 0	Nominal range

Tab. 271 Output range 0 … 10 V

Output range ±10 V	Measuring value			Range
	binary	hexadecimal	decimal	
10 V 5V 4.885mV 0	0000 0111 1111 1111 0000 0011 1111 1111 0000 0000 0000 0001 0000 0000 0000 0000	07FF 03FF 0001 0000	2047 1023 1 0	Nominal range
-4.885mV -5V -10V	1xxx x111 1111 1111 1xxx x100 0000 0001 1xxx x000 0000 0001	FFFF FC01 F800	-1 -1023 -2048	Nominal range

Tab. 272 Output range ±10 V

11.5.2 Parameter Bytes

Byte	Signification
0	Settings Channel 0
1	reserviert
2	reserviert
3	reserviert
4	Settings Channel 1
5	reserviert
6	reserviert
7	reserviert
8	Settings Channel 2
9	reserviert
10	reserviert
11	reserviert
12	Settings Channel 3
13	reserviert
14	reserviert
15	reserviert

Tab. 273 Parameter bytes

11.5.2.1 Bitbelegung der Parameterbytes

Byte 0,4,8,12 **Settings Channel 0,1,2,3**

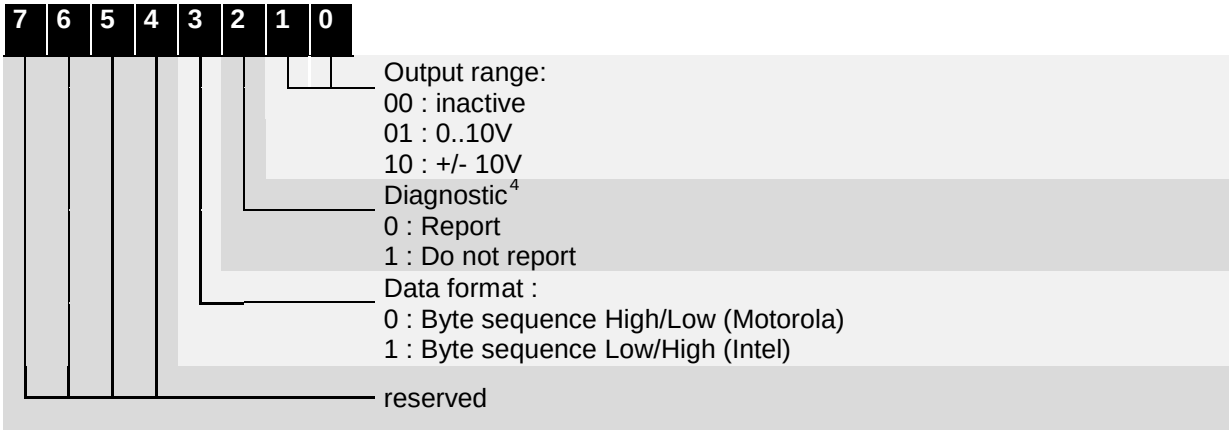


Fig. 111 Bit assignment of byte 0,4,8,12

Unused channels should be disabled in order to optimize cycle time.

[4] Diagnostic information of the corresponding channel.

11.6 AO4 C 4xM12 (I) – Art.No. 56720, AO4 C 4xM12 (I) VA – Art.No. 5672050

11.6.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AO4 C 4xM12 (I)	56720	-	4 Words	83_{hex} 43_{hex} DD_{hex} 90_{hex} 10_{hex}
AO4 C 4xM12 (I) VA	5672050	-	4 Words	83_{hex} 43_{hex} DD_{hex} 90_{hex} 10_{hex}

Tab. 274 Identification

11.6.2 I/O Data

11.6.2.1 Output data ODM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

Tab. 275 Output data (ODM)

11.6.2.2 Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	0	-	-	-	-	210	29	28	27	26	25	24	23	22	21	20

Tab. 276 Byte sequence High/Low - Motorola (Standard setting)

11.6.2.3 Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	27	26	25	24	23	22	21	20	0	-	-	-	-	210	29	28

Tab. 277 Byte sequence Low/High – Intel

11.6.2.4 Representation of Analog Values

Output range 0..20 mA	Measuring value			Range
	binary	hexadecimal	decimal	
20 mA **10 mA** **4 mA** **0 mA**	0xxx x111 1111 1111 0xxx x011 1111 1111 0xxx x001 1001 1001 0xxx x000 0000 0000	07FF 03FF 0199 0000	2047 1023 409 0	Nominal range

Tab. 278 Output range 0..20 mA

Output range 4..20 mA	Measuring value			Range
	binary	hexadecimal	decimal	
20 mA **10 mA** **4 mA**	0xxx x111 1111 1111 0xxx x010 1111 1111 0xxx x000 0000 0000	07FF 02FF 0000	2047 767 0	Nominal range

Tab. 279 Output range 4..20 mA

11.6.3 Parameter bytes

Byte	Signification
0	Settings Channel 0
1	Reserved
2	Reserved
3	Reserved
4	Settings Channel 1
5	Reserved
6	Reserved
7	Reserved
8	Settings Channel 2
9	Reserved
10	Reserved
11	Reserved
12	Settings Channel 3
13	Reserved
14	Reserved
15	Reserved

Tab. 280 Parameter bytes

11.6.3.1 Bit assignment of parameter bytes

Byte 0,4,8,12 Settings Channel 0,1,2,3

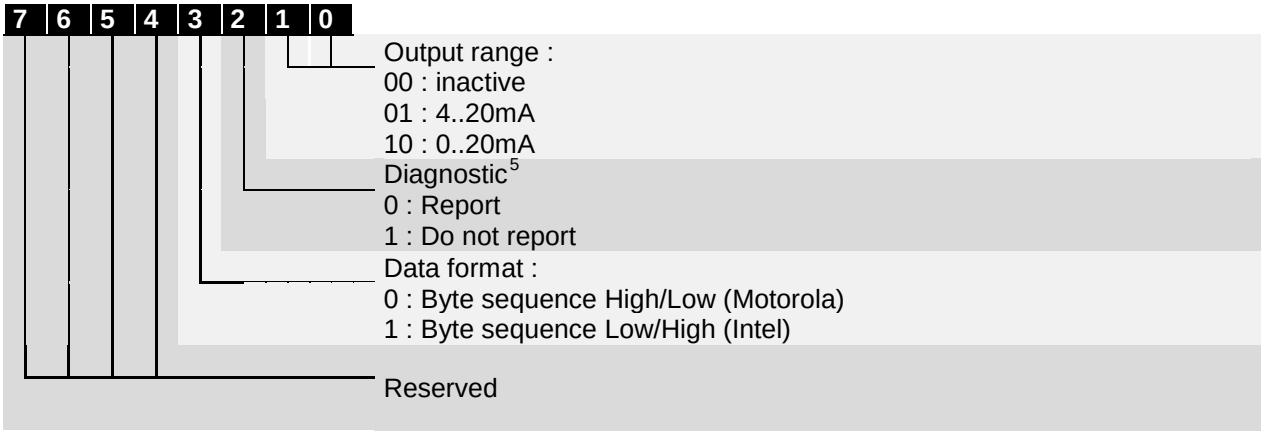


Fig. 112 Bit assignment of parameter bytes 0,4,8,12

Unused channels should be disabled in order to optimize cycle time.

11.7 AO4 E 4xM12 (I) – Art.No. 56721

11.7.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AO4 E 4xM12 (I)	56721	-	4 Words	83_{hex} 43_{hex} DD_{hex} 91_{hex} 10_{hex}

Tab. 281 Identification

11.7.2 I/O Data

11.7.2.1 Output data ODM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

Tab. 282 Output data (ODM)

[5] Diagnostic information of the corresponding channel.

11.7.2.2 Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	0	-	-	-	-	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}

Tab. 283 Byte sequence High/Low - Motorola (Standard setting)

11.7.2.3 Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	0	-	-	-	-	2^{10}	2^{9}	2^{8}

Tab. 284 Byte sequence Low/High – Intel

11.7.2.4 Representation of Analog Values

Output range 0..20 mA	Measuring value			Range
	binary	hexadecimal	decimal	
20 mA 10 mA 4 mA 0 mA	0xxx x111 1111 1111 0xxx x011 1111 1111 0xxx x001 1001 1001 0xxx x000 0000 0000	07FF 03FF 0199 0000	2047 1023 409 0	Nominal range

Tab. 285 Output range 0..20 mA

Output range 4..20 mA	Measuring value			Range
	binary	hexadecimal	decimal	
20 mA 10 mA 4 mA	0xxx x111 1111 1111 0xxx x010 1111 1111 0xxx x000 0000 0000	07FF 02FF 0000	2047 767 0	Nominal range

Tab. 286 Output range 4..20 mA

11.7.3 Parameter bytes

Byte	Signification
0	Settings Channel 0
1	Reserved
2	Reserved
3	Reserved
4	Settings Channel 1
5	Reserved
6	Reserved
7	Reserved
8	Settings Channel 2
9	Reserved
10	Reserved
11	Reserved
12	Settings Channel 3
13	Reserved
14	Reserved
15	Reserved

Tab. 287 Parameter bytes

11.7.3.1 Bit assignment of parameter bytes

Byte 0,4,8,12 Settings Channel 0,1,2,3

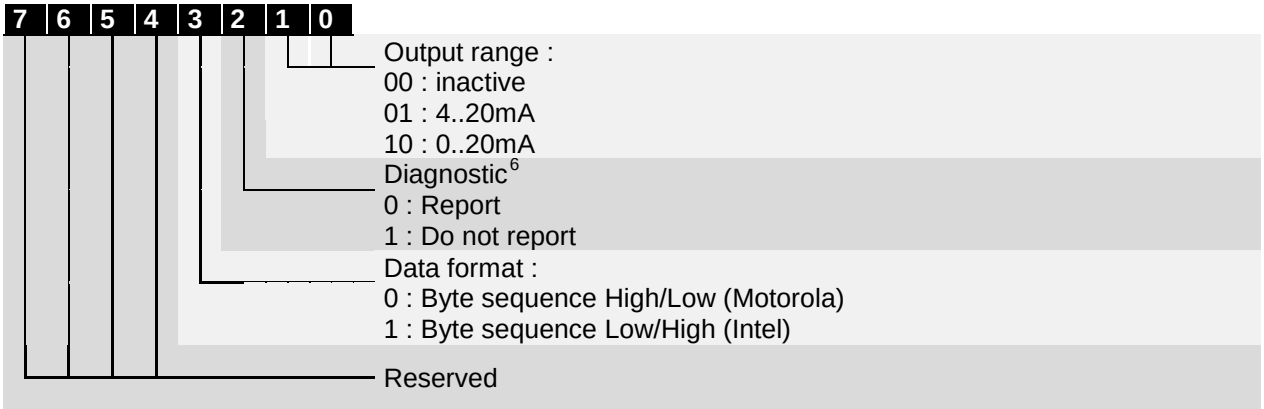


Fig. 113 Bit assignment of parameter bytes 0,4,8,12

Unused channels should be disabled in order to optimize cycle time.

[6] Diagnostic information of the corresponding channel.

11.8 AI4 C 4xM12 (I) – Art.No. 56730, AI4 C 4xM12 (I) VA – Art.No. 5673050

11.8.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AI4 C 4xM12 (I)	56730	4 Words	-	43_{hex} 43_{hex} DD_{hex} $9A_{hex}$ 10_{hex}
AI4 C 4xM12 (I) VA	5673050	4 Words	-	43_{hex} 43_{hex} DD_{hex} $9A_{hex}$ 10_{hex}

Tab. 288 Identification

11.8.2 I/O Data

11.8.2.1 Input Data IDM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

Tab. 289 Input data (IDM)

11.8.2.2 Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	0	214	213	212	211	210	29	28	27	26	25	24	23	22	21	20

Tab. 290 Byte sequence High/Low - Motorola (Standard setting)

11.8.2.3 Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	27	26	25	24	23	22	21	20	0	214	213	212	211	210	29	28

Tab. 291 Byte sequence Low/High - Intel

11.8.2.4 Representation of Analog Values

Measuring range 0..20 mA	Measuring value			Range	Diagnostic
	binary	hexadecimal	decimal		
> 20 mA	0111 1111 1111 1111	7FFF	32767	Overshooting	Yes
20 mA 10 mA 4 mA 0	0111 1111 1111 1111 0011 1111 1111 1111 0001 1001 1001 1001 0000 0000 0000 0000	7FFF 3FFF 1999 0000	32767 16383 6553 0	Nominal range	-
< 0 mA	0000 0000 0000 0000	0000	0	Undershooting	-

Tab. 292 Measuring range 0..20 mA

Measuring range 4..20 mA	Measuring value			Range	Diagnostic
	binary	hexadecimal	decimal		
>20 mA	0111 1111 1111 1111	7FFF	32767	Overshooting	Yes
20 mA 10 mA 4 mA	0111 1111 1111 1111 0010 1111 1111 1010 0000 0000 0000 0000	7FFF 2FFA 0000	32767 12282 0	Nominal range	-
< 4 mA	0000 0000 0000 0000	0000	0	Undershooting	Yes[7]

Tab. 293 Measuring range 4..20 mA

11.8.3 Parameter bytes

Byte	Signification
0	Settings Channel 0
1	Reserved
2	Channel 0 : Delta
3	
4	Settings Channel 1
5	Reserved
6	Channel 1 : Delta
7	
8	Settings Channel 2
9	Reserved
10	Channel 2 : Delta
11	
12	Settings Channel 3
13	Reserved
14	Channel 3 : Delta
15	

Tab. 294 Parameter bytes

[7] "Line breakage" <2mA or "Lower threshold undershot" < 4mA

11.8.3.1 Bit assignment of parameter bytes

Byte 0,4,8,12 Settings Channel 0,1,2,3

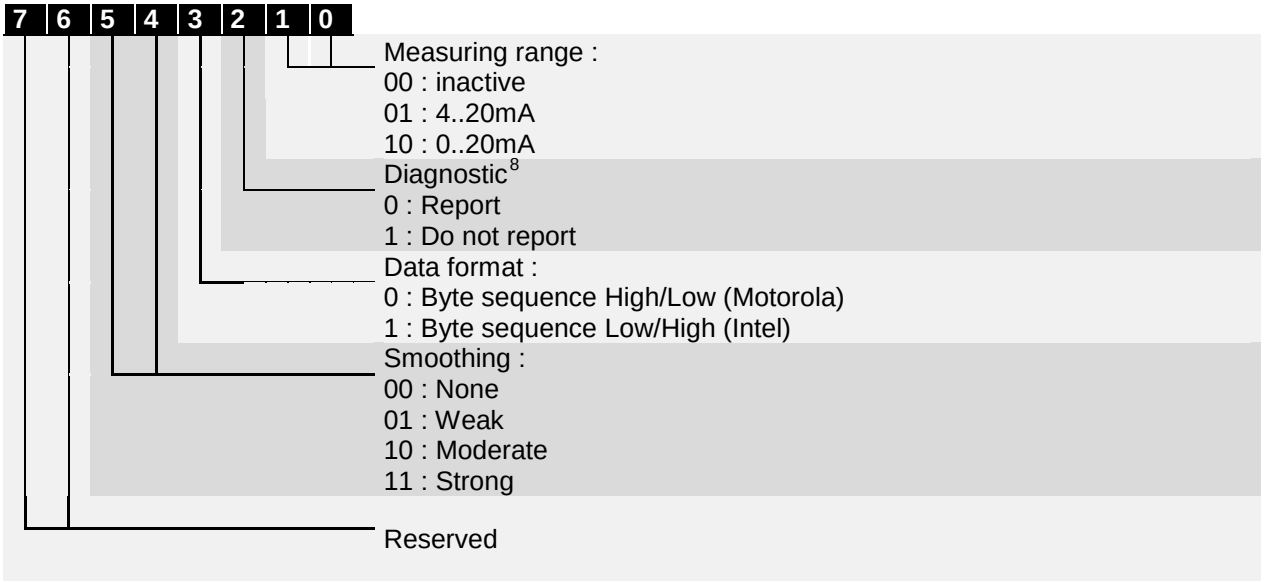


Fig. 114 Bit assignment of byte 0,4,8,12

Byte (2,3),(6,7),(10,11),(14,15) Channel (0,1,2,3) : Delta

Data type	Unsigned16
Admissible values	0..32767

Tab. 295 Bit assignment of bytes (2,3),(6,7),(10,11),(14,15)

Unused channels should be disabled in order to optimize cycle time.

[8] Diagnostic information of the corresponding channel.

11.9 AI4 E 4xM12 (I) – Art.No. 56731

11.9.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AI4 E 4xM12 (I)	56731	4 Words	-	43_{hex} 43_{hex} DD_{hex} $9B_{hex}$ 12_{hex}

Tab. 296 Identification

11.9.2 I/O Data

11.9.2.1 Input Data IDM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

Tab. 297 Input data (IDM)

11.9.2.2 Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	0	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}

Tab. 298 Byte sequence High/Low - Motorola (Standard setting)

11.9.2.3 Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	0	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}

Tab. 299 Byte sequence Low/High - Intel

11.9.2.4 Representation of Analog Values

Measuring range 0..20 mA	Measuring value			Range	Diagnostic
	binary	hexadecimal	decimal		
> 20 mA	0111 1111 1111 1111	7FFF	32767	Overshooting	Yes
20 mA 10 mA 4 mA 0	0111 1111 1111 1111 0011 1111 1111 1111 0001 1001 1001 1001 0000 0000 0000 0000	7FFF 3FFF 1999 0000	32767 16383 6553 0	Nominal range	-
< 0 mA	0000 0000 0000 0000	0000	0	Undershooting	No

Tab. 300 Measuring range 0..20 mA

Measuring range 4..20 mA	Measuring value			Range	Diagnostic
	binary	hexadecimal	decimal		
>20 mA	0111 1111 1111 1111	7FFF	32767	Overshooting	Yes
20 mA 10 mA 4 mA	0111 1111 1111 1111 0010 1111 1111 1010 0000 0000 0000 0000	7FFF 2FFA 0000	32767 12282 0	Nominal range	-
< 4 mA	0000 0000 0000 0000	0000	0	Undershooting	Yes
< 2 mA	0000 0000 0000 0000	0000	0	Line break	Yes

Tab. 301 Measuring range 4..20 mA

The oversteer/understeer range is variable. When the oversteer limit setting is reached, a 0x7FFF message is sent (parameter > 20mA). A zero is generated below the understeer limit. If the oversteer limit below 20 mA is reached, the value remains at the oversteer limit.

If there is a line ruipture, the finel value is generated (0x7FFF).

11.9.3 Parameter bytes

Byte	Signification
0	Settings Channel 0 …3
1	Settings module diagnostics and byte change
2	Selection filter Channel 0, settings of smoothing and diagnostics channel 0
3	Selection filter Channel 1, settings of smoothing and diagnostics channel 1
4	Selection filter Channel 2, settings of smoothing and diagnostics channel 2
5	Selection filter Channel 3, settings of smoothing and diagnostics channel 3
6	Limit undershooting 0...20mA channel 0
7	Limit undershooting 0...20mA channel 1

Byte	Signification
8	Limit undershooting 0...20mA channel 2
9	Limit undershooting 0...20mA channel 3
10	Limit overshooting channel 0
11	Limit overshooting channel 1
12	Limit overshooting channel 2
13	Limit overshooting channel 3
14	Limit undershooting 4...20mA channel 0
15	Limit undershooting 4...20mA channel 1
16	Limit undershooting 4...20mA channel 2
17	Limit undershooting 4...20mA channel 3

Tab. 302 Parameter bytes

See also "Application adjustable values for overshoot and undershoot".

11.9.3.1 Bit assignment of parameter bytes

Byte 0 **Settings channel 0,1,2,3**

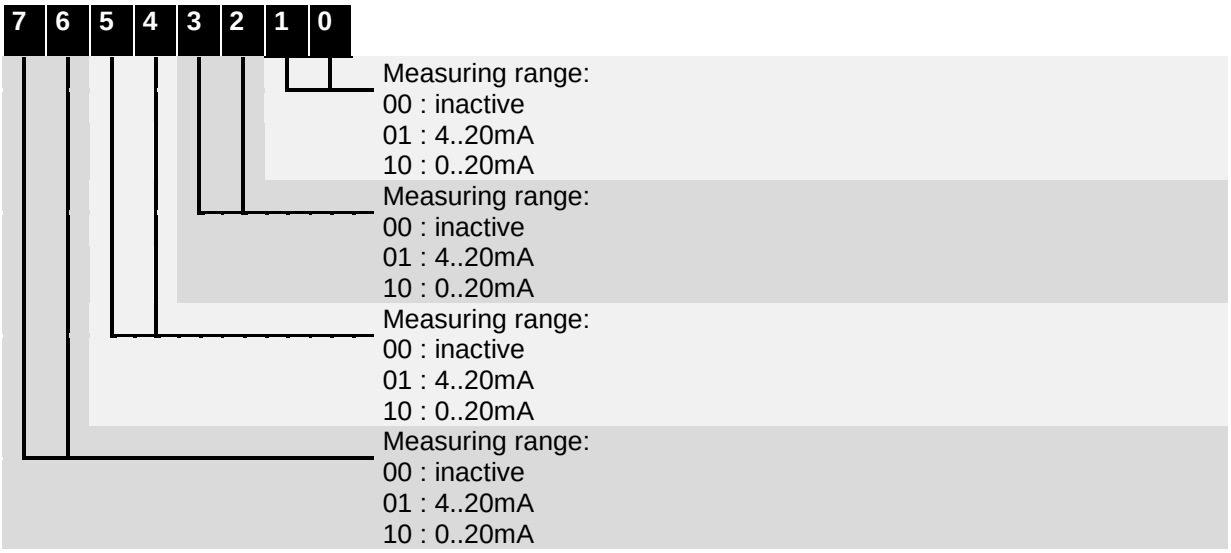


Fig. 115 Bit assignment byte 0

Byte 1 **Settings of all module diagnostics / byte format**

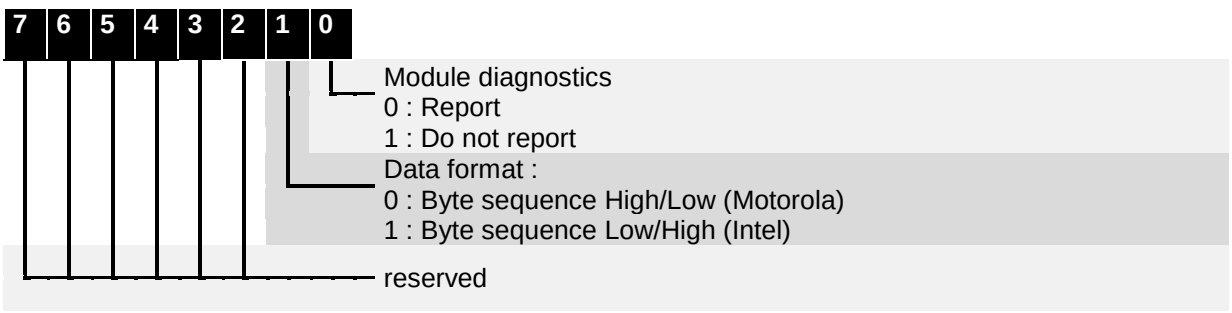

7 6 5 4 3 2 1 0
Module diagnostics
0 : Report
1 : Do not report
Data format :
0 : Byte sequence High/Low (Motorola)
1 : Byte sequence Low/High (Intel)
reserved

Fig. 116 Bit assignment byte 1

Byte 2 … 5 **Settings of smoothing and diagnostics 0 bis 3**

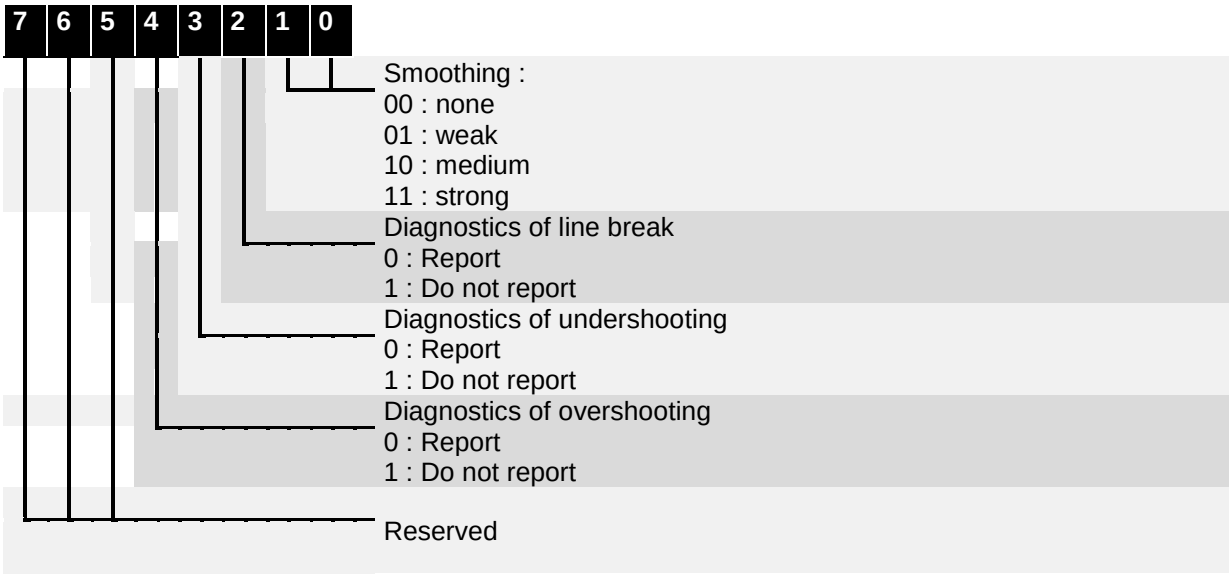


Fig. 117 Bit assignment byte 2 … 5

Byte 6 … 9	**Settings of undershooting Channel 0 … 3 (0 … 20mA)**
Data type	**Unsigned8**
Permitted values	**0…230**

Tab. 303 Bit assignment of bytes 6 … 9

Byte 10 … 13	**Settings of overshooting Channel 0 … 3 (0 … 20mA)**
Data type	**Unsigned8**
Permitted values	**0…230**

Tab. 304 Bit assignment of bytes 10 … 13

Byte 14 … 17	**Settings of undershooting Channel 0 … 3 (4 … 20mA)**
Data type	**Unsigned8**
Permitted values	**20…230**

Tab. 305 Bit assignment of bytes 14 … 17

The current value is indicated with one decimal place. The value 230 corresponds to 23.0mA, the value 40 to 4.0 mA.

Unused channels should be disabled in order to optimize cycle time.

11.9.4 Application adjustable values for overshoot and undershoot

Operation mode 0 to 20mA

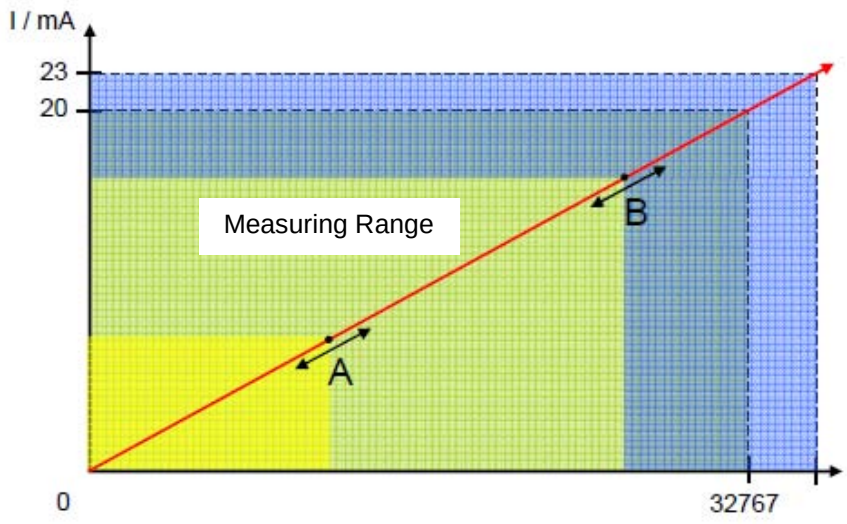


Fig. 118 Adjustable Values for overshoot and undershoot operation mode 0...20 mA

- Threshold value for undershoot (A) parameterizable from 0 to 23mA
- Threshold value for overshoot (B) parameterizable from 0 to 23mA
- If A is > B, bus diagnostics are made via bus nod 56521 (parameter error) and the diagnostic LED on the associated port lights up.

Operation mode 4 to 20mA

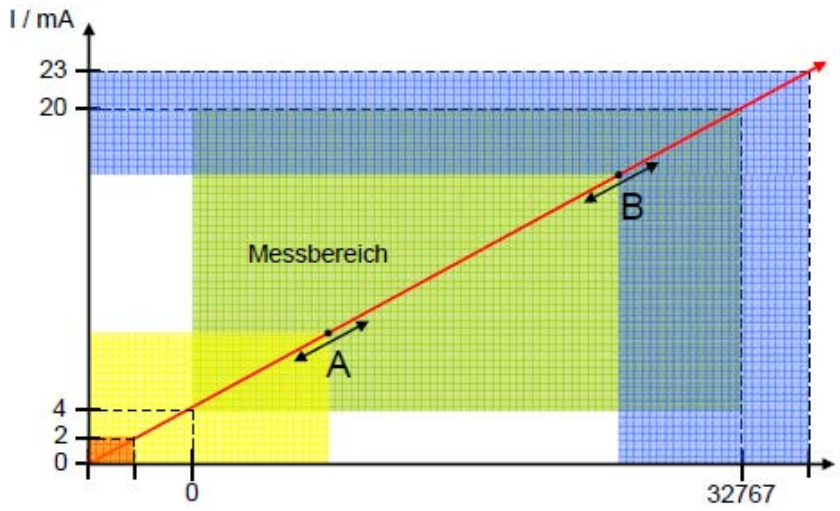


Fig. 119 Adjustable Values for overshoot and undershoot operation mode 4...20 mA

- If current value is < 2 mA the module reports diagnostics of line break.
- Threshold value for undershoot (A) parameterizable from 0 to 23mA
- Threshold value for overshoot (B) parameterizable from 0 to 23mA
- If A is > B, bus diagnostics are made (parameter error) and the diagnostic LED on the associated port lights up.

11.10 AI4 C 4xM12 RTD – Art.No. 56740, AI4 C 4xM12 RTD VA– Art.No. 5674050

11.10.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AI4 C 4xM12 RTD	56740	4 Words	-	43_{hex} 43_{hex} DD_{hex} $A4_{hex}$ 09_{hex}
AI4 C 4xM12 RTD VA	5674050	4 Words	-	43_{hex} 43_{hex} DD_{hex} $A4_{hex}$ 05_{ex}

Tab. 306 Identification

11.10.2 I/O Data

11.10.2.1 Input Data IDM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

Tab. 307 Input data (IDM)

11.10.2.2 Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	VZ	214	213	212	211	210	29	28	27	26	25	24	23	22	21	20

Tab. 308 Byte sequence High/Low - Motorola (Standard setting)

11.10.2.3 Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	27	26	25	24	23	22	21	20	VZ	214	213	212	211	210	29	28

Tab. 309 Byte sequence Low/High - Intel

11.10.2.4 Representation of Analog Values

Resistance test:

Range	Units		Measuring range 0...3000 Ohm	Diagnostic
	hexadecimal	decimal		
Overflow	7FFF	32767	>3251,2	Wire break
	>7530	>30000	3000<R<3251,2	Upper limit
Nominal range	7530 5100 0	30000 20736 0	3000 2073.6 0	_
Underflow	<0	<0	<0	Yes

Tab. 310 Resistance test

Platinum Standard:

Range 0.1°C	Units	Temperatu	Units	Temperatu	Diagnostic

	hexadecimal	decimal	re in °C	hexadecimal	decimal	re in °F	
Overflow	7FFF	32767	>1800	7FFF	32767	>3272	**Wire break**
	>2134	>8500	850<T<1800	>3D04	>15620	1562<T<3272	**Upper limit**
Nominal range	2134 0 F830	8500 0 -2000	850 0 -200	3D04 0 F330	15620 0 -3280	1562 0 -328	_
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	**Yes**

Tab. 311 Platinum Standard

Nickel Standard:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexadecimal	decimal		hexadecimal	decimal		
Overflow	7FFF	32767	>1800	7FFF	32767	>3272	**Wire break**
	>9C4	>2500	250<T<1800	>12D4	>4820	482<T<3272	**Upper limit**
Nominal range	9C4 0 FDA8	2500 0 -600	250 0 -60	2134 0 FD08	4820 0 -760	482 0 -76	_
Underflow	<FDA8	<-600	<-60	<FD08	<-760	<-76	**Yes**

Tab. 312 Nickel Standard

11.10.3 Parameter bytes

Byte	Signification
0	Global modul settings
1	Settings Channel 0
2	Settings Channel 1
3	Settings Channel 2
4	Settings Channel 3

Tab. 313 Parameter bytes

11.10.3.1 Bit assignment of parameter bytes

Byte 0: Global module settings

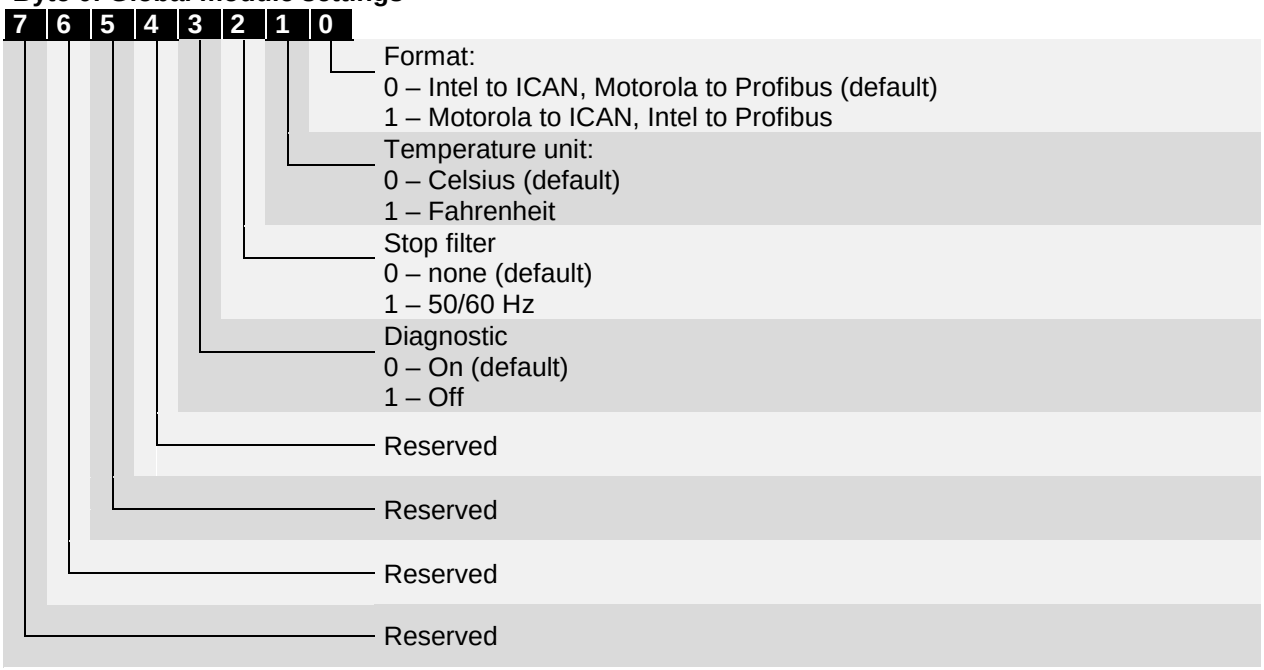


Fig. 120 Bit assignment of byte 0

Byte 1, 2, 3, 4: measurement settings channel 0, 1, 2, 3

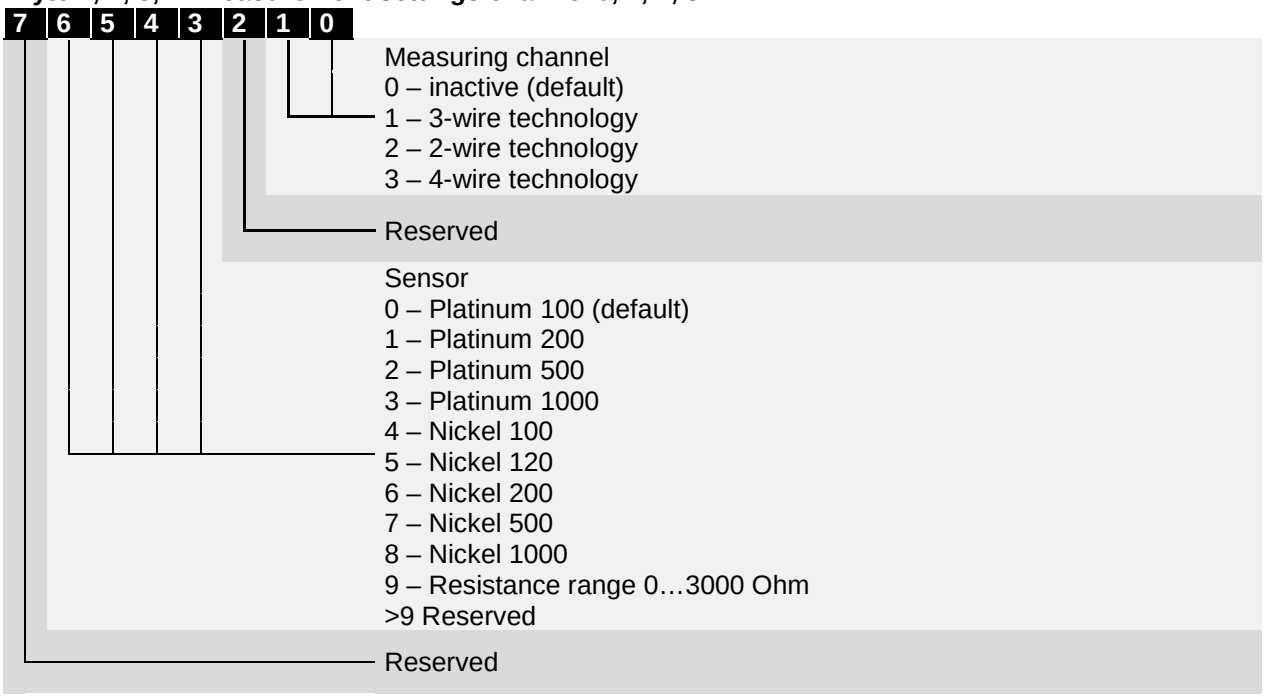


Fig. 121 Bit assignment of byte 1, 2, 3, 4

Unused channels should be disabled in order to optimize cycle time.

11.11 AI4 E 4xM12 RTD – Art.No. 56741

11.11.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AI4 E 4xM12 RTD	56741	4 Words	-	43_{hex} 43_{hex} DD_{hex} $A5_{hex}$ 05_{hex}

Tab. 314 Identification

11.11.2 I/O Data

11.11.2.1 Input Data IDM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

Tab. 315 Input data (IDM)

11.11.2.2 Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	VZ	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}

Tab. 316 Byte sequence High/Low - Motorola (Standard setting)

11.11.2.3 Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	VZ	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}

Tab. 317 Byte sequence Low/High - Intel

11.11.2.4 Representation of Analog Values

Resistance test:

Range	Units		Measuring range 0...3000 Ohm	Diagnostic
	hexadecimal	decimal		
Overflow	7FFF	32767	>3251,2	Wire break
	>7530	>30000	3000<R<3251,2	Upper limit
Nominal range	7530 5100 0	30000 20736 0	3000 2073.6 0	_
Underflow	<0	<0	<0	Yes

Tab. 318 Resistance test

Platinum Standard:

Range 0.1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	Hexadecimal	decimal		Hexadecimal	decimal		
Overflow	7FFF	32767	>1800	7FFF	32767	>3272	Wire break
	>2134	>8500	850<T<1800	>3D04	>15620	1562<T<3272	Upper limit
Nominal range	2134 0 F830	8500 0 -2000	850 0 -200	3D04 0 F330	15620 0 -3280	1562 0 -328	_
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	Yes

Tab. 319 Platinum Standard

Nickel Standard:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	Hexadecimal	decimal		Hexadecimal	decimal		
Overflow	7FFF	32767	>1800	7FFF	32767	>3272	Wire break
	>9C4	>2500	250<T<1800	>12D4	>4820	482<T<3272	Upper limit
Nominal range	9C4 0 FDA8	2500 0 -600	250 0 -60	2134 0 FD08	4820 0 -760	482 0 -76	_
Underflow	<FDA8	<-600	<-60	<FD08	<-760	<-76	Yes

Tab. 320 Nickel Standard

11.11.3 Parameter bytes

Byte	Signification
0	Global modul settings
1	Settings Channel 0
2	Settings Channel 1
3	Settings Channel 2
4	Settings Channel 3

Tab. 321 Parameter bytes

11.11.3.1 Bit assignment of parameter bytes

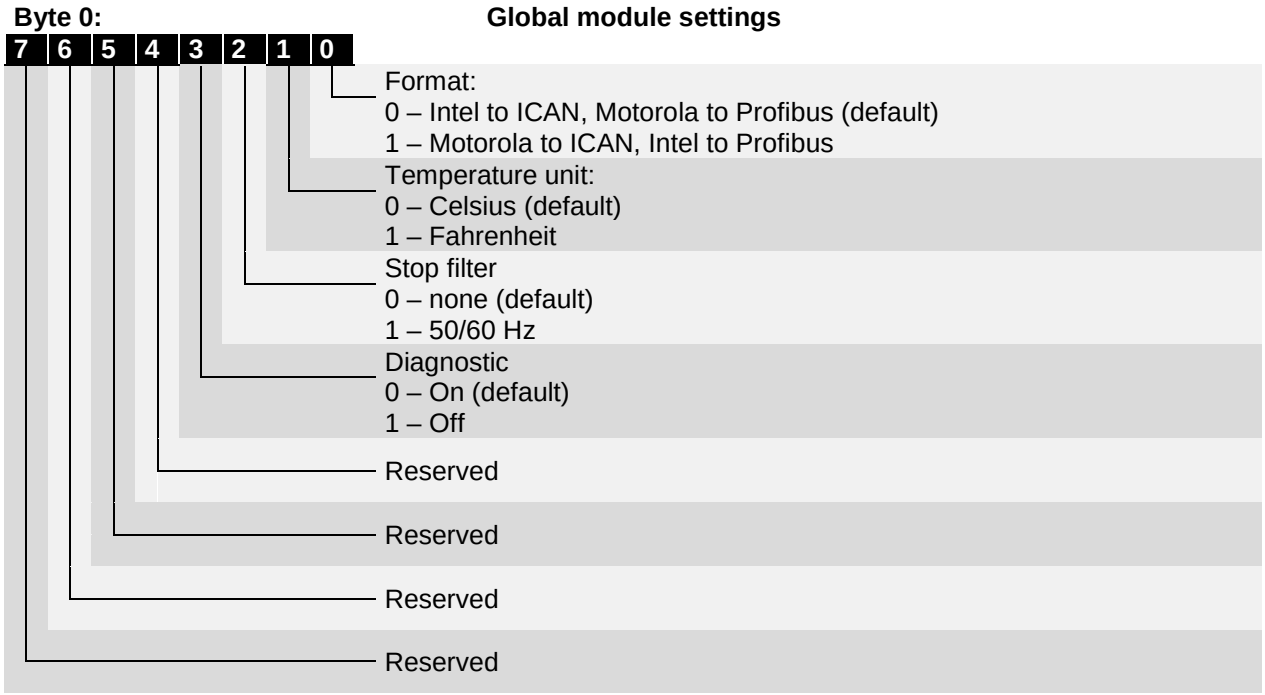


Fig. 122 Bit assignment of byte 0

Byte 1, 2, 3, 4: **measurement settings channel 0, 1, 2, 3**

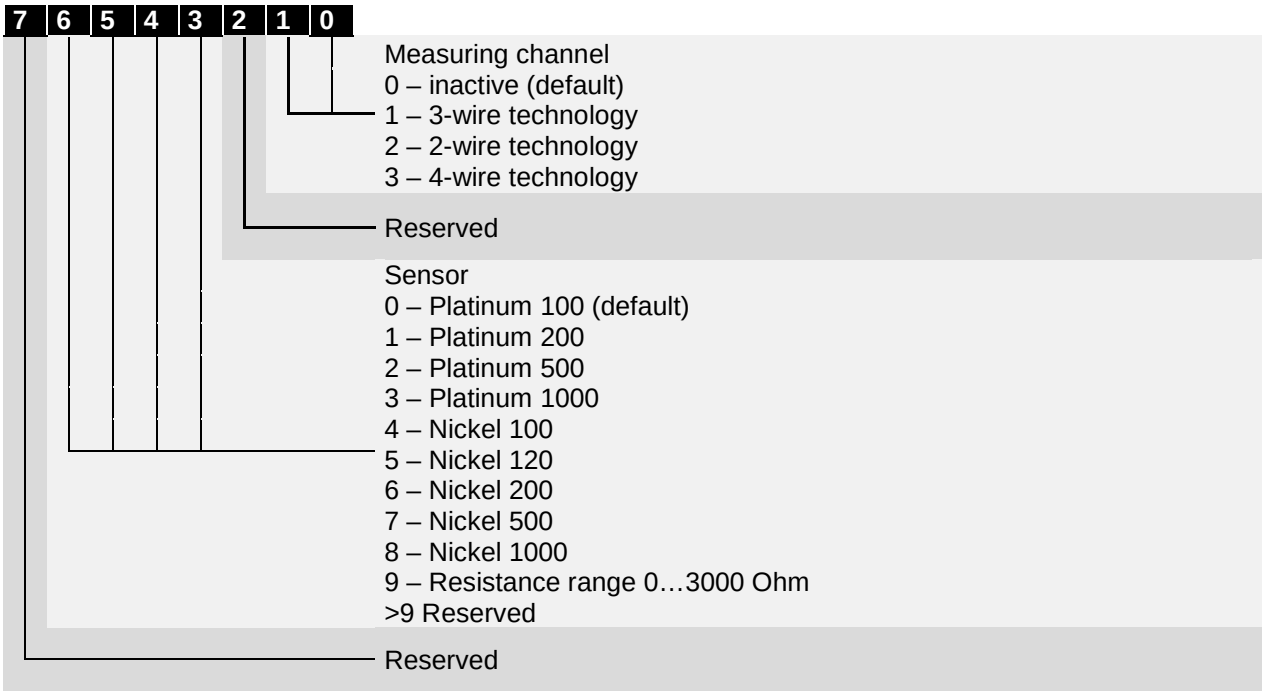


Fig. 123 Bit assignment of byte 1, 2, 3, 4

Unused channels should be disabled in order to optimize cycle time.

11.12 AI4 C 4xM12 TH – Art.No. 56748, AI4 C 4xM12 TH VA – Art.No. 5674850

11.12.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AI4 C 4xM12 TH	56748	4 Words	-	$43_{hex}43_{hex}DD_{hex}AC_{hex}\,05_{hex}$
AI4 C 4xM12 TH VA	5674850	4 Words	-	$43_{hex}43_{hex}DD_{hex}AC_{hex}\,05_{hex}$

Tab. 322 Identification

11.12.2 I/O Data

11.12.2.1 Input Data IDM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

Tab. 323 Input data (IDM)

11.12.2.2 Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	VZ	214	213	212	211	210	29	28	27	26	25	24	23	22	21	20

Tab. 324 Byte sequence High/Low - Motorola (Standard setting)

11.12.2.3 Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	27	26	25	24	23	22	21	20	VZ	214	213	212	211	210	29	28

Tab. 325 Byte sequence Low/High - Intel

11.12.2.4 Representation of analog values

Sensor Type K:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexadecimal	decimal		hexadecimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>3598	>13720	1372<T<2000	>6098	>24728	2473<T<3272	Upper limit
Nominal range	3598 0 F830	13720 0 -2000	1372 0 -200	6098 0 F330	24728 0 -3280	2473 0 -328	–
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	Yes

Tab. 326 Sensor Type K

Sensor Type N:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexadecimal	decimal		hexadecimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>32C8	>13000	1300<T<2000	>5B88	>23432	2343<T<2473	Upper limit
Nominal range	35C8 0 F830	13000 0 -2000	1300 0 -200	5B88 0 F330	23432 0 -3280	2343 0 -328	_
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	Yes

Tab. 327 Sensor Type N

Sensor Type J:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexadecimal	decimal		hexadecimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>2EE0	>12000	1200<T<2000	>5480	>21632	2163<T<2473	Upper limit
Nominal range	2EE0 0 F830	12000 0 -2000	1200 0 -200	5480 0 F330	21632 0 -3280	2163 0 -328	_
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	Yes

Tab. 328 Sensor Type J

Sensor Type E:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexadecimal	decimal		hexadecimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>2710	>10000	1000<T<2000	>4670	>18032	1803<T<2473	Upper limit
Nominal range	2710 0 F830	10000 0 -2000	1000 0 -200	6098 0 F330	24728 0 -3280	1803 0 -328	_
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	Yes

Tab. 329 Sensor Type E

Sensor Type R:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexadecimal	decimal		hexadecimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>4510	>17680	1768<T<2000	>7D8C	>32140	3214<T<3272	Upper limit
Nominal range	4510 0 FDB2	17680 0 -500	250 0 -50	7D8C 0 FC5C	32140 0 -932	3214 0 -93	_
Underflow	<FD B2	<-500	<-50	<FC5C	<-932	<-93	Yes

Tab. 330 Sensor Type R

11.12.3 Parameter bytes

Byte	Signification
0	global module settings
1	measurement settings channel 0
2	measurement settings channel 1
3	measurement settings channel 2
4	measurement settings channel 3

Tab. 331 Parameter bytes

11.12.3.1 Bit assignment of parameter bytes

Byte 0: Global module settings

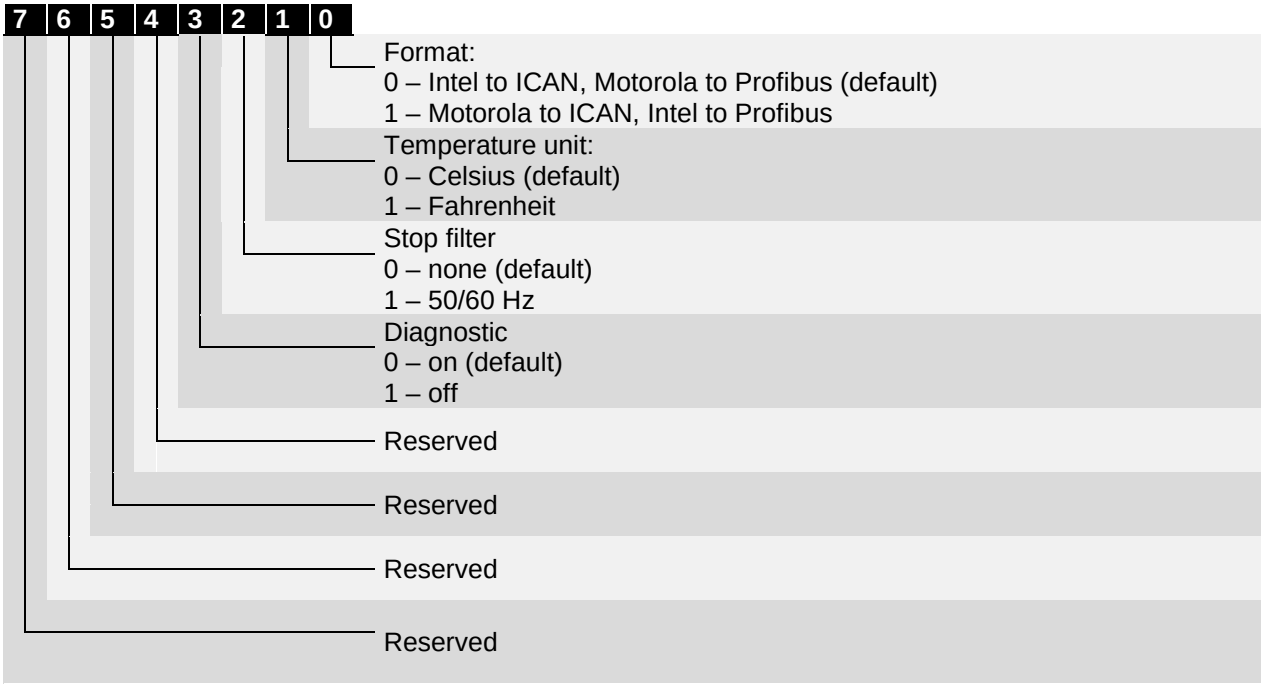


Fig. 124 Bit assignment of byte 0

Byte 1, 2, 3, 4: measurement settings channel 0, 1, 2, 3

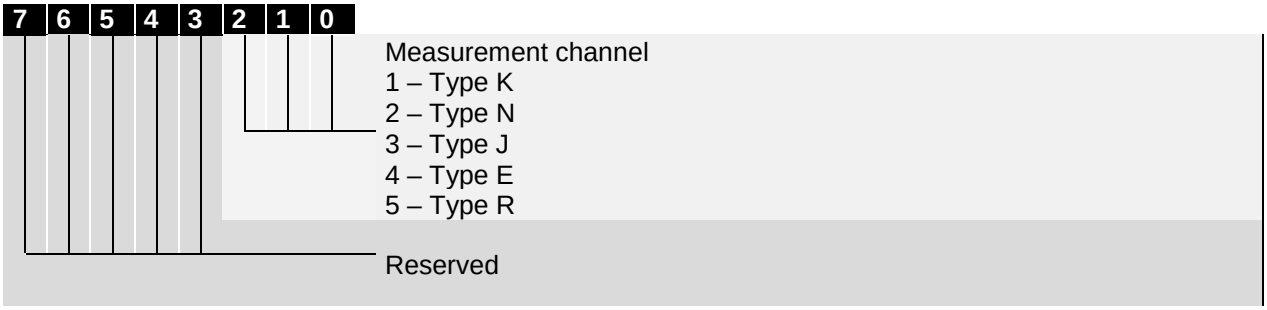


Fig. 125 Bit assignment of byte 1, 2, 3, 4

Unused channels should be disabled in order to optimize cycle time.

11.13 AI4 E 4xM12 TH – Art.No. 56749

11.13.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AI4 E 4xM12 TH	56749	4 Words	-	$43_{hex}43_{hex}DD_{hex}AD_{hex}\,05_{hex}$

Tab. 332 Identification

11.13.2 I/O Data

11.13.2.1 Input Data IDM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

Tab. 333 Input data (IDM)

11.13.2.2 Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	VZ	214	213	212	211	210	29	28	27	26	25	24	23	22	21	20

Tab. 334 Byte sequence High/Low - Motorola (Standard setting)

11.13.2.3 Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	27	26	25	24	23	22	21	20	VZ	214	213	212	211	210	29	28

Tab. 335 Byte sequence Low/High - Intel

11.13.2.4 Representation of analog values

Sensor Type K:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexadecimal	decimal		hexadecimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>3598	>13720	1372<T<2000	>6098	>24728	2473<T<3272	Upper limit
Nominal range	3598 0 F830	13720 0 -2000	1372 0 -200	6098 0 F330	24728 0 -3280	2473 0 -328	–
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	Yes

Tab. 336 Sensor Type K

Sensor Type N:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexadecimal	decimal		hexadecimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>32C8	>13000	1300<T<2000	>5B88	>23432	2343<T<2473	Upper limit
Nominal range	35C8 0 F830	13000 0 -2000	1300 0 -200	5B88 0 F330	23432 0 -3280	2343 0 -328	–
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	Yes

Tab. 337 Sensor Type N

Sensor Type J:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexadecimal	decimal		hexadecimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>2EE0	>12000	1200<T<2000	>5480	>21632	2163<T<2473	Upper limit
Nominal range	2EE0 0 F830	12000 0 -2000	1200 0 -200	5480 0 F330	21632 0 -3280	2163 0 -328	_
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	Yes

Tab. 338 Sensor Type J

Sensor Type E:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexadecimal	decimal		hexadecimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>2710	>10000	1000<T<2000	>4670	>18032	1803<T<2473	Upper limit
Nominal range	2710 0 F830	10000 0 -2000	1000 0 -200	6098 0 F330	24728 0 -3280	1803 0 -328	_
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	Yes

Tab. 339 Sensor Type E

Sensor Type R:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexadecimal	decimal		hexadecimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>4510	>17680	1768<T<2000	>7D8C	>32140	3214<T<3272	Upper limit
Nominal range	4510 0 FDB2	17680 0 -500	250 0 -50	7D8C 0 FC5C	32140 0 -932	3214 0 -93	_
Underflow	<FD B2	<-500	<-50	<FC5C	<-932	<-93	Yes

Tab. 340 Sensor Type R

11.13.3 Parameter bytes

Byte	Signification
0	global module settings
1	measurement settings channel 0
2	measurement settings channel 1
3	measurement settings channel 2
4	measurement settings channel 3

Tab. 341 Parameter bytes

11.13.3.1 Bit assignment of parameter bytes

Byte 0: Global module settings

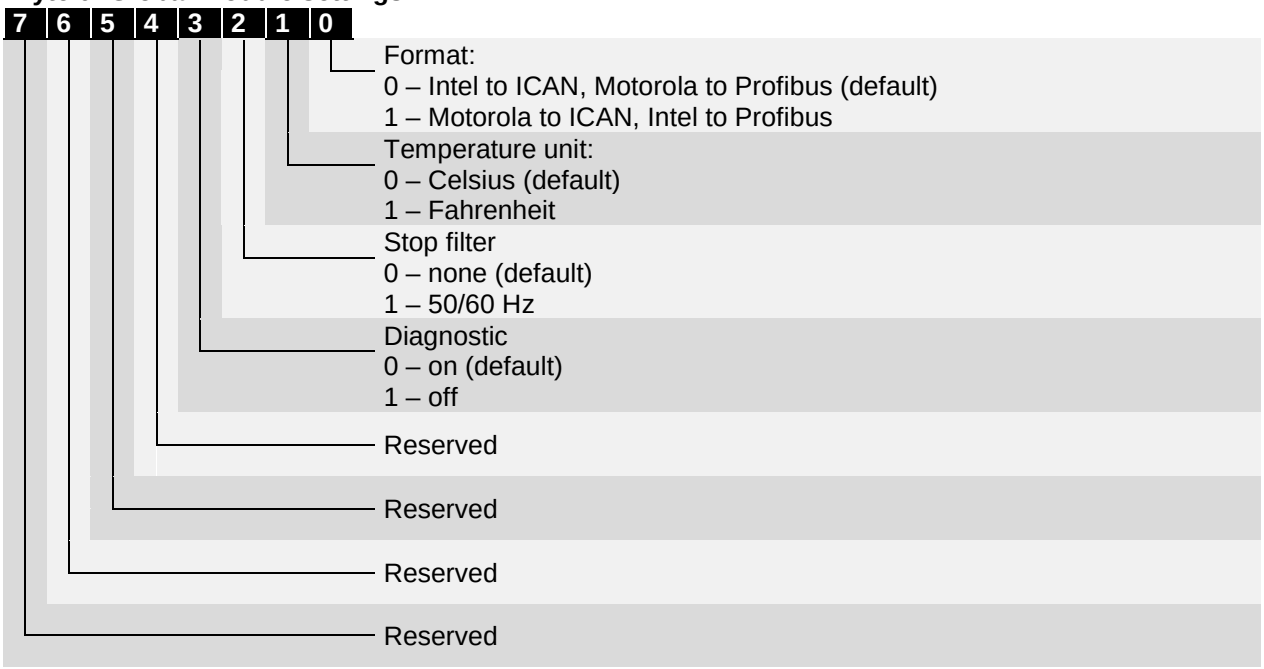


Fig. 126 Bit assignment of byte 0

Byte 1, 2, 3, 4: measurement settings channel 0, 1, 2, 3

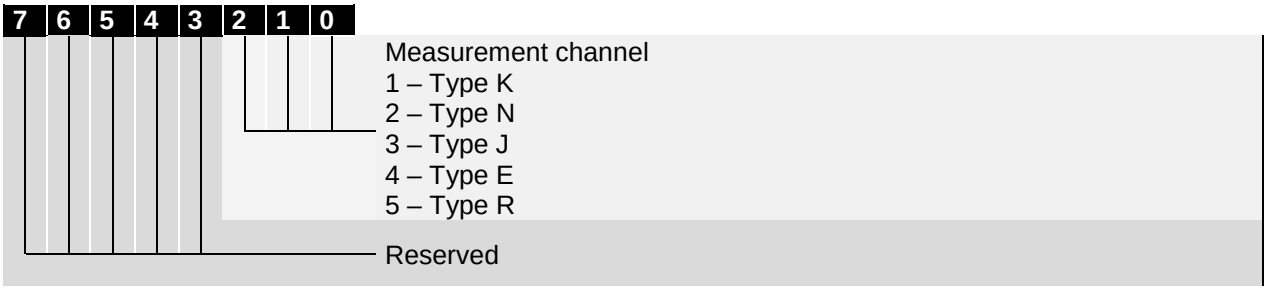


Fig. 127 Bit assignment of byte 1, 2, 3, 4

Unused channels should be disabled in order to optimize cycle time.

12 Function Modules

12.1 CNT2 C 4xM12 – Art.No. 56750

A protocol integrated in the module CNT2 C 4xM12 – Art. no. 56750 makes it possible to read or write data from the module or to perform services in a cyclic data transfer.

- Read-out the software version.
- Alternative access to counter, comparative value, and parameter.
- Parameter change.

Please check our homepage for a software library for the control used.

12.1.1 Identification

Description	Art.Nr.	Process data		Identification
		Input	Ausgang	
CNT2 C 4xM12	56750	8 Byte	8 Byte	$C3_{hex}$ 07_{hex} 07_{hex} DD_{hex} AE_{hex} $0D_{hex}$

Tab. 342 Identification

12.1.2 I/O Data

12.1.2.1 Input Data IDM

Byte	0	1	2	3	4	5	6	7
Meßwert	Stat_0	Stat_1	CD32I Status	CD32I Index	CD32I Data3	CD32I Data2	CD32I Data1	CD32I Data0

Tab. 343 Input data (IDM)

Bit assignment Byte Stat_0 :

Bit	Name	Signification
0	Status_0	Comparative value Counter 0 reached/not reached Status_0 is set when the comparative value is reached. Status_0 is reset when RESET_0 is set
1	GATE_0	Status Input Counter 0 GATE_0 release or block counter.
2	UPDOWN_0	Status counting direction Counter 0
3	DO_0	Status output DO_0 DO_0 status of digital output 0
4 … 7	-	Reserved

Tab. 344 Bit assignment Byte Stat_0

Bit assignment Byte Stat_1 :

Bit	Name	Signification
0	Status_1	Comparative value Counter 1 reached/not reached. Status_1 is set when the comparative value is reached. Status_1 is reset when RESET_1 is set
1	GATE_1	Status Input Counter 1 GATE_1 realease or block counter
2	UPDOWN_1	Status Counting direction Counter 1
3	DO_1	Status output DO_1 DO_1 Status of digital output 1
4 … 7	-	Reserved

Tab. 345 Bit assignment Byte Stat_1

Chapter 12.1.3 "Communication Driver" describes access and signification of the IDM bytes 2 to 7.

12.1.2.2 Output Data ODM

Byte	0	1	2	3	4	5	6	7
Measuring value	Ctrl_0	Ctrl_1	CD32O Ctrl	CD32O Index	CD32O Data3	CD32O Data2	CD32O Data1	CD32O Data0

Tab. 346 Output data (ODM)

Bit assignment Byte Ctrl_0 :

Bit	Name	Signification
0	Gate 0	Activate counter Gate 0 set, counter can start
1	RESET_0	Reset counter 0 to initial value (0000hex)
2	DO_0	If 1, switch off or reset output 0
3	Up/Down_0	0 – process controlled, 1- down PLC controlled
4 … 7	-	Reserved

Tab. 347 Bit assignment Byte Ctrl_0

Bitbelegung Byte Ctrl_1 :

Bit	Name	Signification
0	Gate 1	Activate counter Gate 1 set, counter can start
1	RESET_1	Reset counter 1 to initial value (0000hex)
2	DO_1	If 1, switch off or reset output 1
3	Up/Down_1	0 – process controlled, 1- down PLC controlled
4 … 7	-	Reserved

Tab. 348 Bit assignment Byte Ctrl_1

Chapter 12.1.3 "Communication Driver" describes access and signification of the IDM bytes 2 to 7.

Behavior of the gate signal:

Gate	Control	Process	
	0	0	Counter blocked
	1	0	Counter released
	1	1	Counter released
	0	1	Counter released

Tab. 349 Behavior of the gate signal

Behavior of the Up/Down Signal:

Up/Down	Control	Prozess	
	0	0	Counting direction up
	1	0	Counting direction down
	1	1	Counting direction down
	0	1	Counting direction down

Tab. 350 Behavior of the Up/Down Signal

Counter and corresponding outputs operate independently of each other.When the comparative value is reached, counter and corresponding output must both be reset. If only the counter is reset, the corresponding output would remain as it is.

12.1.3 Comunications Driver

The following access codes are written in the CTRL output data (Byte 2).

Decimal values for the control byte:

	Write access	Read access
Byte	192	128
Double word	224	160

Tab. 351 Decimal values for the control byte

The following tables show the corresponding index (Byte 3) for input and output data:

Index	Access	Designation	Value	Description
0	Write	Control	0	
1	Read	Status	0	
2	Read	MAX_WR_ADR	28	
3	Read	MAX_RD_ADR	28	
4	Write	PWD_HIGH	0	
5	Write	PWD_LOW	0	
6	Read	Version	0	SW version
7	Read	Version	1	
8	Read	cValue0	0	Counter 0 counter reading
9	Read		0	
10	Read		0	
11	Read		0	
12	Read	cValue1	0	Counter 1 counter reading
13	Read		0	
14	Read		0	
15	Read		0	
16	Read/Write	Parameter[0]	0	Global module settings
17	Read/Write	Parameter[1]	0	Settings Counter 0
18	Read/Write	Parameter[2]	0	Reserved
19	Read/Write	Parameter[3]	0	Comparative value Counter 0
20	Read/Write	Parameter[4]	0	
21	Read/Write	Parameter[5]	0	
22	Read/Write	Parameter[6]	0	
23	Read/Write	Parameter[7]	0	Settings Counter 1
24	Read/Write	Parameter[8]	0	Reserved
25	Read/Write	Parameter[9]	0	Comparative value Counter 1
26	Read/Write	Parameter[10]	0	
27	Read/Write	Parameter[11]	0	
28	Read/Write	Parameter[12]	0	

Tab. 352 Corresponding index (Byte 3) for input and output data

The parameters mentioned in this table are described in chapter 12.1.4 "Parameter bytes".

12.1.4 Parameter bytes

Byte	Signification
0	Globale module settings
1	Settings Counter 0
2	Reserved
3	Comparative value Channel 0
4	Comparative value Channel 0
5	Comparative value Channel 0
6	Comparative value Channel 0
7	Settings Counter 1
8	Reserved
9	Comparative value Channel 1
10	Comparative value Channel 1
11	Comparative value Channel 1
12	Comparative value Channel 1

Tab. 353 Parameter bytes

12.1.4.1 Bit assignment of parameter bytes

Byte 0: Global module settings

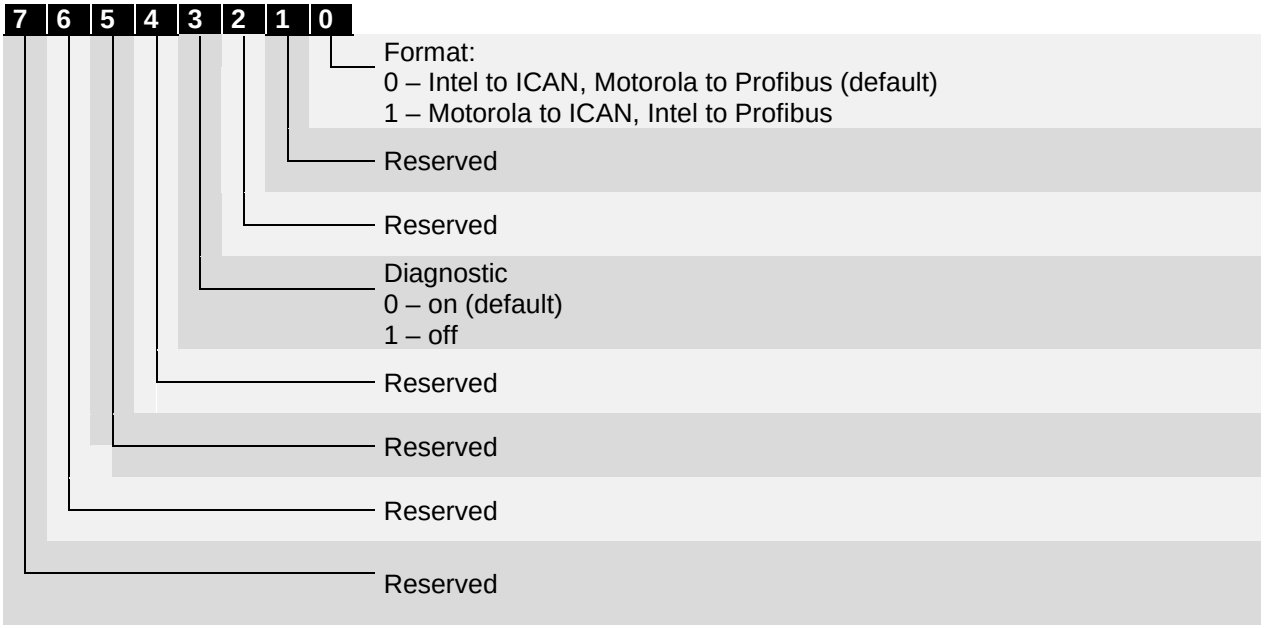


Fig. 128 Bit assignment of byte 0

Byte 1: Settings Counter 0

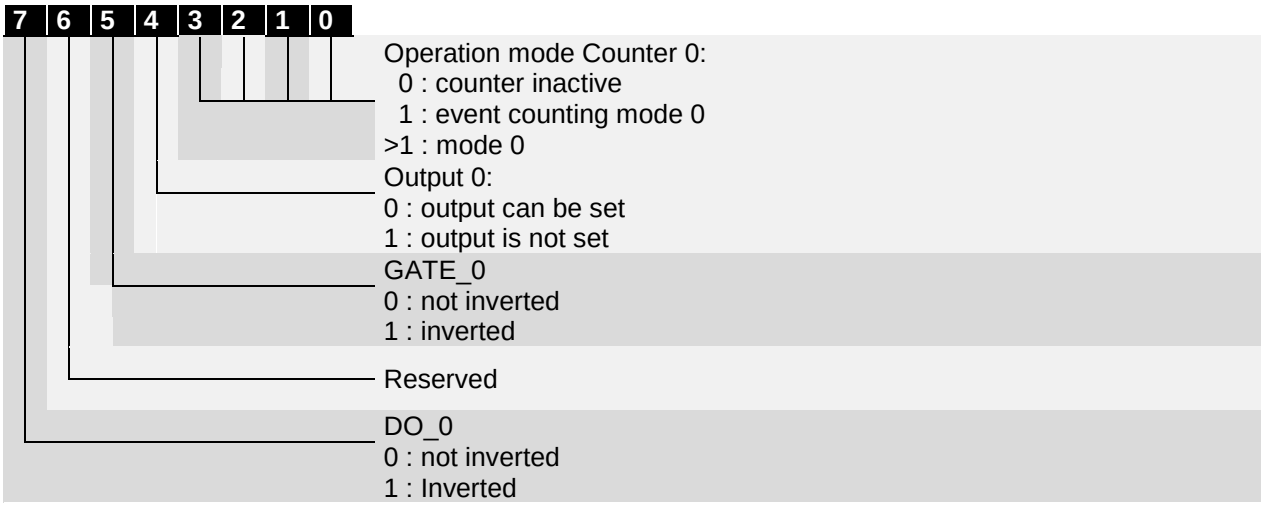


Fig. 129 Bit assignment of byte 1

Byte 2 Reserved

Byte 3, 4, 5, 6: Comparative value Channel 0

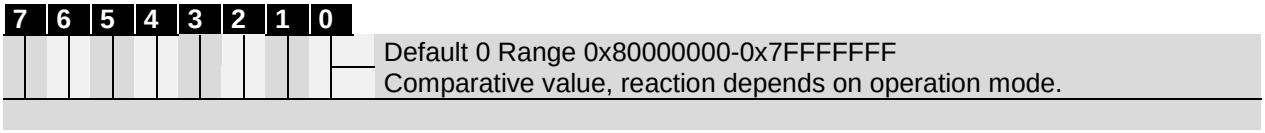


Fig. 130 Byte 3, 4, 5, 6 Comparative value Channel 0

Byte 7: Settings Counter 1

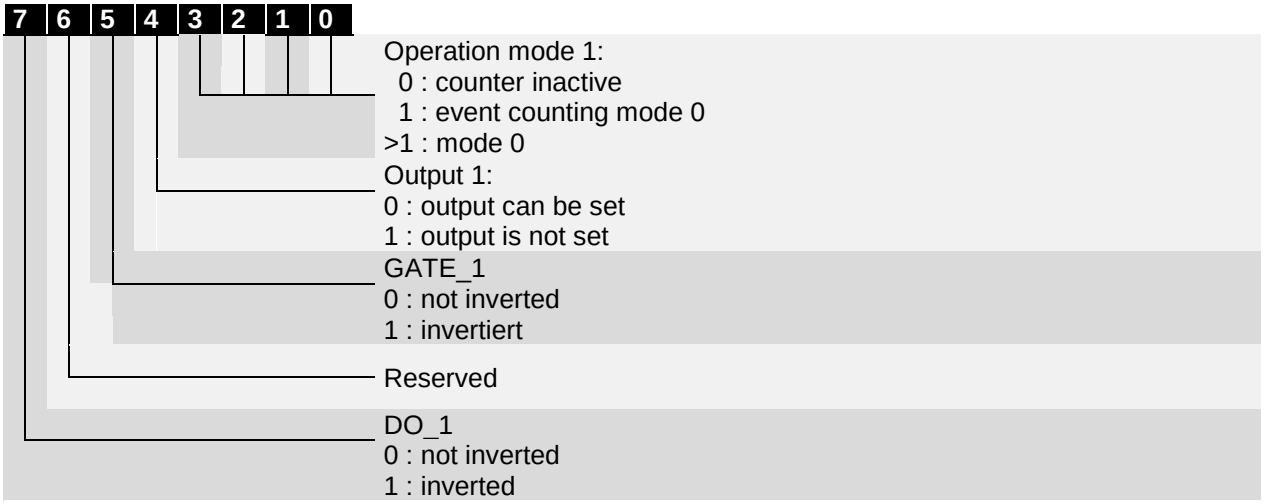


Fig. 131 Byte 7 Settings Counter 1

Byte 8 Reserved

Byte 9, 10, 11, 12: Comparative value Channel 1

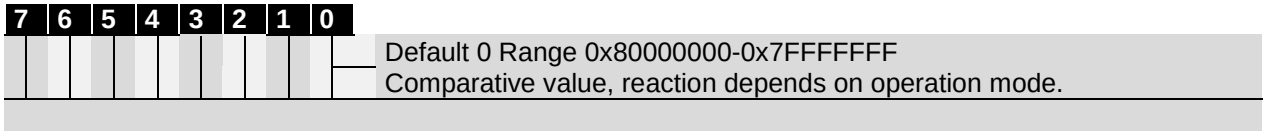


Fig. 132 Byte 9, 10, 11, 12 Comparative value Channel 1

12.1.4.2 Examples

Below an example of a write and read access.

Read access to the double word counter reading:

The counter reading is a double word, therefore the access code 160 Dez "read access double word“ is described in the output data Byte 2 (CTRL).

In this example, we access the counter reading Counter_0, this is index 8.

Byte	0	1	2	3	4	5	6	7
Measuring value	Ctrl_0	Ctrl_1	Ctrl 160 Dez	Index 8 Dez	Data3 0	Data2 0	Data1 0	Data0 0

Tab. 354 Read access to counter reading Counter_0

If this command is successfully executed, the following response is reported to the input data.

The counter reading in our example is 0x12345678

Byte	0	1	2	3	4	5	6	7
Measuring value	Stat_0	Stat_1	Ctrl 160 Dez	Index 8 Dez	Data3 12	Data2 34	Data1 56	Data0 78

Tab. 355 Read access to counter reading 0x12345678

The previous command has to be reset in order to execute another command. For this purpose a zero is entered in Byte 2 (CTRL).

Byte	0	1	2	3	4	5	6	7
Measuring value	Ctrl_0	Ctrl_1	Ctrl 0	Index 0	Data3 0	Data2 0	Data1 0	Data0 0

Tab. 356 Procedure for further commands

Write access to the double word comparative value:

The comparative value is a double word, therefore the access code 224 Dez "read access double word“ is described in the output data Byte 2 (CTRL).

In this example, we access to the comparative value Counter_1, this is Index 25, and we describe this value with 0x7FFFFFFF.

Byte	0	1	2	3	4	5	6	7
Measuring value	Ctrl_0	Ctrl_1	Ctrl 224 Dez	Index 25 Dez	Data3 7F	Data2 FF	Data1 FF	Data0 FF

Tab. 357 Write access to counter reading Counter_1

The previous command has to be reset in order to execute another command. For this purpose a zero is entered in Byte 2 (CTRL).

Byte	0	1	2	3	4	5	6	7
Measuring value:	Ctrl_0	Ctrl_1	Ctrl 0	Index 0	Data3 0	Data2 0	Data1 0	Data0 0

Tab. 358 Procedure for further commands

Read/Write Access on byte value

For the byte access proceed as with the double word, only the access codes have to be adjusted.

(Write 192, Read 128). The following steps as described before.

12.2 DIO4 RS485 E 3xM12 – Art.Nr. 56760

12.2.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DIO4 RS485 E 3xM12	56760	8 Bytes	8 Bytes	$C3_{hex}$ 07_{hex} 07_{hex} DD_{hex} $B8_{hex}$ 06_{hex}

Tab. 359 Identification

12.2.2 I/O – Data

12.2.2.1 Input Data IDM

Byte	0	1	2	3	4	5	6	7
Measuring value	Status_0	Status_1	Status_2	Data4	Data3	Data2	Data1	Data0

Tab. 360 Input data (IDM)

Bit assignment Byte Status_0 :

Bit	Name	Wert	Signification
0 bis 2	Retval	0	Request_Done
		1	Request_Done
		2	Transmit_Done
		3	Delete RX-Buffer_Done
		4	Delete TX-Buffer_Done
		5	Reset_Done
		6	-
		7	-
3	Rx		Sign in Rx-Buffer available for release
4	In00		Input Channel 00
5	In01		Input Channel 01
6	In10		Input Channel 10
7	In11		Input Channel 11

Tab. 361 Bit assignment Byte Status_0

Bit assignment Byte Status_1 :

Status	Signification	
0	DataLengthRx (0 bis 5)	Length of RX data that are transmitted in the first transmit PDO max. 5 bytes
1		
2		
3	ResNb (0 bis 31)	Response number. Is incremented any time a PLC request is processed.
4		
5		
6		
7		

Tab. 362 Bit assignment Byte Status_1

Bit assignment Byte Status_2 (communication status) :

Status	Description	Signification
0	TX_BUSY	Module is transmitting data
1	-	-
2	RX_WARN	Rx-Buffer 80% full
3	RX_PARITY	Parity fault during receipt
4	XOFF	XOFF was received
5	TX_OVERFLOW	Tx buffer overflow
6	RX_OVERFLOW	Rx buffer overflow
7	XOFF_TIMEOUT	No XON was received after XOFF within the parameterized monitoring time. Send will be restarted.

Tab. 363 Bit assignment Byte Status_2

12.2.2.2 Output data ODM

Byte	0	1	2	3	4	5	6	7
Measuring value	Ctrl_0	Ctrl_1	Ctrl_2	Data4	Data3	Data2	Data1	Data0

Tab. 364 Output data ODM

Bitbelegung Byte 0 : Ctrl_0

Bit	Name	Valuet	Signification
0 bis 2	CMD	0	Request
		1	Request
		2	Transmit
		3	Delete RX-Buffer
		4	Delete TX-Buffer
		5	Reset
		6	-
		7	-
3	-	-	-
4	Out00		Output Channel 00
5	Out01		Output Channel 01
6	Out10		Output Channel 10
7	Out11		Output Channel 11

Tab. 365 Bitbelegung Byte 0 : Ctrl_0

Command	Explanation
Request	If 0->1 or 1->0 Tx and Rx data are exchanged with the buffers.
Transmit	All signs in the tx buffer are send. Tx buffer is empty.
Delete RX-Buffer	Delete Rx buffer.
Delete TX-Buffer	Delete Tx buffer. Signs are NOT sent.
Reset	Resets interface, RX and TX Buffer are deleted.

Tab. 366 Commands

Bit assignment Byte 1 : Ctrl_1

Status	Signification	
0	DataLengthTx (0 bis 5)	Length of Tx data that are stored in the Tx buffer of the module. max. 5 bytes.
1		
2		
3	Reserved	
4	Reserved	
5	Reserved	
6	Reserved	
7	Reserved	

Tab. 367 Bit assignment Byte 1 : Ctrl_1

12.2.3 Parameter bytes

Byte	Signification
0	Function Channel 00,01,10,11 Art.-No. 56760
1	Safe status output 00,01,10,11
2	Settings RS485 Byte 0
3	Settings RS485 Byte 1
4	XOFF Timeout
5	Send delay

Tab. 368 Parameter bytes

12.2.3.1 Bit assignment of parameter bytes

Byte 0: Function Channel 00,01,10,11

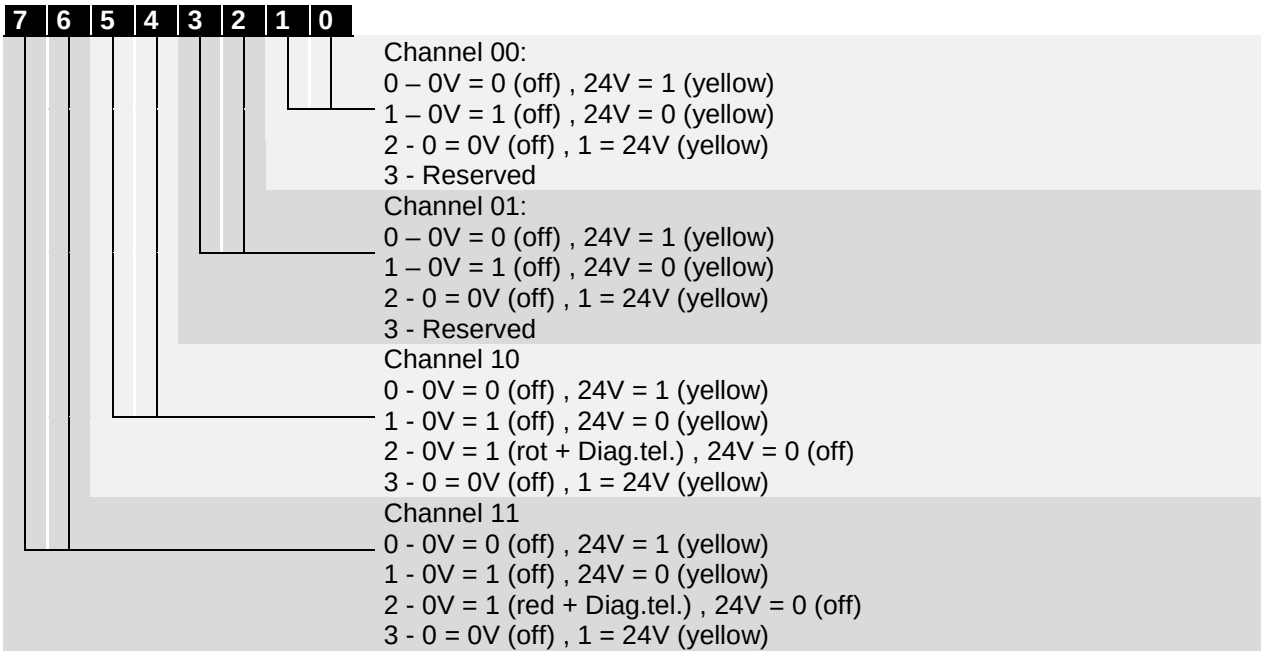

7 6 5 4 3 2 1 0
Channel 00:
0 – 0V = 0 (off) , 24V = 1 (yellow)
1 – 0V = 1 (off) , 24V = 0 (yellow)
2 - 0 = 0V (off) , 1 = 24V (yellow)
3 - Reserved
Channel 01:
0 – 0V = 0 (off) , 24V = 1 (yellow)
1 – 0V = 1 (off) , 24V = 0 (yellow)
2 - 0 = 0V (off) , 1 = 24V (yellow)
3 - Reserved
Channel 10
0 - 0V = 0 (off) , 24V = 1 (yellow)
1 - 0V = 1 (off) , 24V = 0 (yellow)
2 - 0V = 1 (rot + Diag.tel.) , 24V = 0 (off)
3 - 0 = 0V (off) , 1 = 24V (yellow)
Channel 11
0 - 0V = 0 (off) , 24V = 1 (yellow)
1 - 0V = 1 (off) , 24V = 0 (yellow)
2 - 0V = 1 (red + Diag.tel.) , 24V = 0 (off)
3 - 0 = 0V (off) , 1 = 24V (yellow)

Fig. 133 Bit assignment of byte 0

Byte 1: Safe status output 00,01,10,11

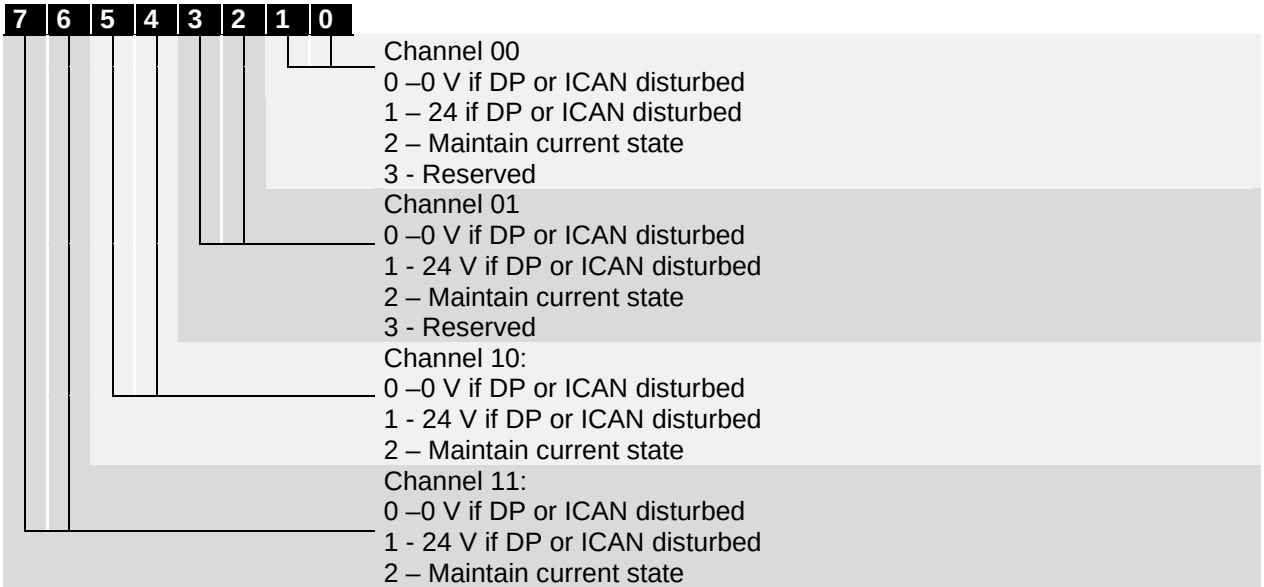

7 6 5 4 3 2 1 0
Channel 00
0 –0 V if DP or ICAN disturbed
1 – 24 if DP or ICAN disturbed
2 – Maintain current state
3 - Reserved
Channel 01
0 –0 V if DP or ICAN disturbed
1 - 24 V if DP or ICAN disturbed
2 – Maintain current state
3 - Reserved
Channel 10:
0 –0 V if DP or ICAN disturbed
1 - 24 V if DP or ICAN disturbed
2 – Maintain current state
Channel 11:
0 –0 V if DP or ICAN disturbed
1 - 24 V if DP or ICAN disturbed
2 – Maintain current state

Fig. 134 Bit assignment of byte 1

Byte 2 Settings RS485 Byte 0

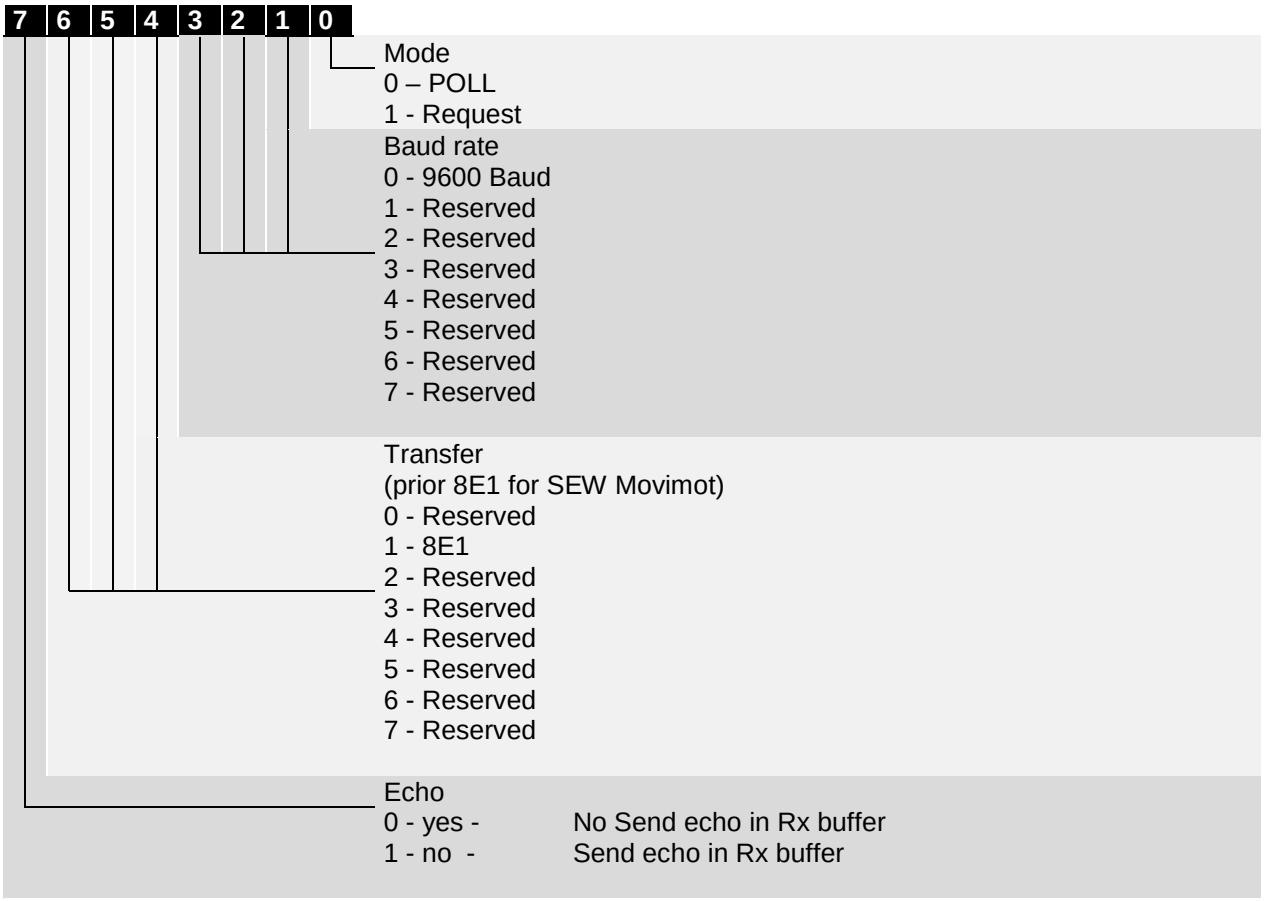


Fig. 135 Bit assignment of byte 2

Byte 3 Settings RS485 Byte 1

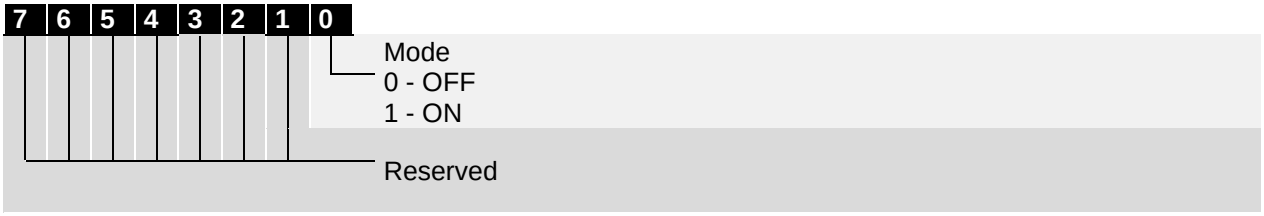


Fig. 136 Bit assignment of byte 3

Byte 4 XOFF Time out

Fig. 137 Bit assignment of byte 4

Byte 5 Send delay

Fig. 138 Bit assignment of byte 5

12.3 Logic E 4xM12 – Art.No. 56771

12.3.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
Logic E 4xM12	56771	1 Byte	-	$43_{hex}00_{hex}DD_{hex}C3_{hex}01_{hex}$

Tab. 369 Identification

12.3.2 I/O – Data

12.3.2.1 Input Data IDM

Byte 0								
Bit	7	6	5	4	3	2	1	0
Channel	Output S4	Output S2	Input Socket 2 Pin 4	Input Socket 2 Pin 2	Input Socket 1 Pin 4	Input Socket 1 Pin 2	Input Socket 0 Pin 4	Input Socket 0 Pin 2

Tab. 370 Input data (IDM)

12.3.3 Parameter bytes

Byte	Signification
0	Settings Logic

Tab. 371 Parameter bytes

12.3.3.1 Bit assignment of Parameter bytes

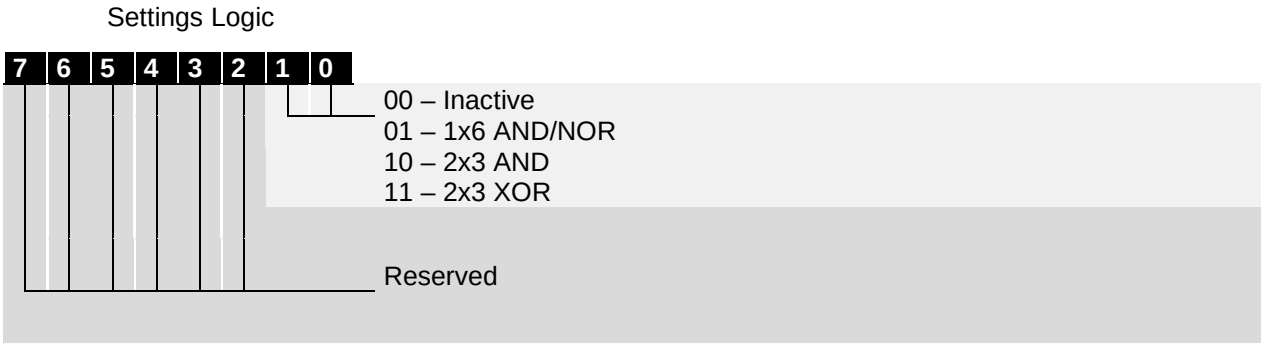


Fig. 139 Bit assignment “Setting Logic”

1x6 AND/NOR:

Function	Pin 2			Pin 4			Output	
	DI1	DI 3	DI5	DI2	DI4	DI6	S2	S4
1x6 AND/NOR	1	1	1	1	1	1	1	0
	0	0	0	0	0	0	0	1
	any other state						0	0

Tab. 372 Function 1x6 AND/NOR

2x3 AND:

Function	Pin 2			Pin 4			Output	
	DI1	DI 3	DI5	DI2	DI4	DI6	S2	S4
2x3 AND	1	1	1	x	x	x	1	x
	x	x	x	1	1	1	x	1
	any other state						0	0

Tab. 373 Function 2x3 AND

2x3 XOR:

Function	Pin 2			Pin 4			Output	
	DI1	DI 3	DI5	DI2	DI4	DI6	S2	S4
2x3 XOR	1	1	1	0	0	0	1	0
	0	0	0	1	1	1	0	1
	any other state						0	0

Tab. 374 Function 2x3 XOR

13 Accessories

A list of Cube67 and Cube67+ accessories is contained in the Cube67+ System Manual Art. No. 56974.

Information on accessories is available in our catalog and our online shop at:

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Glossary

Actuator shutdown	Short-circuit or overload at an output leads to the shutdown of the output.
AI	Analog input
ANSI	American National Standards Institute
AO	Analog output
ASCII	American Standard Code for Information Interchange, character map acc. to ANSI X3.4-1986 standard
BN-P	Bus Node - PROFIBUS, bus node - PROFIBUS
Bus-Run-LED	LED that signals the bus status
Bus segment	Due to the electrical specifications of the RS-485 interface, the number of users on an RS485 network is limited to 32 users. If more than 32 PROFIBUS devices have to be used, the network must be segmented by means of repeaters.
1 byte	corresponds to 8 bits
Cfg F-LED	LED to signal a correct/incorrect configuration.
CTS	RS232 Handshake Clear To Send Line, Flow control for send data
DI	Digital input
DIN TH35	DIN standard mounting rail (35x15mm, 35x7.5mm)
DIO	Digital Input / Output
DO	Digital output.
DP	Decentralized Peripherals. PROFIBUS protocol for high-speed cyclic data exchange.
E/A(I/O)	Input/output -
EC Directive 2004/108/EEC	EMC directive
EMC	Electromagnetic Compatibility
ESD	Electrostatic discharge
FE	Function ground
Freeze Command	The input data of the slave are "frozen".
GSD	The Device Master Data describes the technical features of a PROFIBUS product. This file is required for the PROFIBUS system configuration and is provided by the device manufacturer.
Half Duplex	Not more than one device sends at a certain moment, one or more devices receive.
I	Current
I/O-	Input/ Output

ID number	A 16-bit number that identifies a PROFIBUS product uniquely. It represents a reference for the GSD file. More than one device can have the same ID number, provided that the numbers can be written to a common GDS file. This number is awarded by the PROFIBUS User Organization.
IEC 61158	Worldwide standard for PROFIBUS DP and -FMS, successor of international standard EN 50 170 volume 2.
IO Link	Standardized communication system to link intelligent sensors and actuators to an automation system
IP20	Ingress Protection, standard according to DIN EN 60529 1. Code no. = Protection against touching and foreign bodies 2: Protection against the ingress of solid foreign bodies measuring a diameter of more than 12.5 mm, protection against touching with fingers 2. Code no. = Water protection 0: no protection against ingress
IP67	Ingress Protection, standard according to DIN EN 60529 1. Code no. = Protection against touching and foreign bodies 6: Dust-tight, protection against access with a wire 2. Code no. = Water protection 7: Protection against temporary submersion
LSB	Least significant bit
LWL	Optical fiber
MSB	Most significant bit
Ni	Nickel
PAA	Process map of outputs
PAE	Process map of inputs
PELV	Protective Extra Low Voltage
PNO	PROFIBUS User Organization.
Power-LED	LED to signal the operating status
Pt 100	Temperature sensor on platinum base (0°C is equivalent to 100Ω)
+R	High potential sensor connection.
-R	Low potential sensor connection.
Repeater	Coupling element to process signals between PROFIBUS segments.
RL	Sensor power supply in three-wire mode.
RS-	RS485, low potential
RS+	RS485, high potential
RTD	Resistance Temperature Device
RTS	RS232 Handshake Request To Send Line, Flow control for receive data
Rx	Receiver
RxD	RS232 Receive Data Line

S	Reference potential
Segment	Left segment of the internal system connection (Sockets 0 and 2) and right segment of the system link (Sockets 1 and 3)
	SELVSafety Extra Low Voltage.
Simatic Manager	Programming software for program-logic controllers made by Siemens
PLC	Program-logic controller
Segment	System cable together with modules connected to one or two sockets that belong together
TH	Thermocouple, Thermo element
TH+	High potential sensor connection
TH-	Low potential sensor connection.
Tx	Transmitter
TxD	RS232 Transmit Data Line
Type E, Type J, Type K,	
Type N, Type R	Thermoelements as per DIN EN 60584 standard.
U	Voltage
U/I	Voltage / current
UA (brown terminal)	Actuator supply
UA (red terminal)	Module supply
UB	Operating voltage
UI (red terminal)	Module and sensor supply
US (brown terminal)	Sensor supply
VDMA	Verband Deutscher Maschinen- und Anlagenbau e.V. (Association of German Machinery and Industrial Equipment Manufacturers)
Virtual module	Modules in the GSD file, e.g. line modules or placeholders that do not correspond to any real physical module
Full Duplex	Two devices can both send and receive at the same moment.
XOFF	ASCII Control character DC3, decimal 19 for flow control.
XON	ASCII Control character DC1, decimal 17 for flow control.
VZ	Sign.
ZVEI	Zentralverband Elektrotechnik- und Elektronikindustrie e.V. (German Electrical and Electronic Manufacturers' Association).

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Murrelektronik GmbH | Falkenstraße 3, D-71570 Oppenweiler | P.O. Box 1165, D-71567 Oppenweiler
Phone +49 7191 47-0 | Fax +49 7191 47-130 | info@murrelektronik.com | www.murrelektronik.com

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